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PAPERS AND CONVENTIONS.

Time and again has it been pointed out that a full programme of papers does not always insure the best success of a meeting of a technical organization. Such a programme frequently defeats its own end by trying to cover a vast number of subjects in as many papers; and even when a group of papers on one particular subject is secured, the effect generally seems to be to cut down the discussion, which is really the end sought by the presentation of the papers. The result is that the reports of these conventions contain the conclusions or opinions of the authors of the papers, and but little else. But the object of a convention is to bring together many men interested in some topic, which is then presented in a paper, and in the discussion provoked thereby the opinions and experiences of others are secured. Thus, many sides of the question are presented and the topic is viewed from many points, so that some satisfactory conclusion may generally be reached.

When, however, there is a large number of papers on different topics, the sessions seem to be poorly attended and the haste required in order to have all the papers read limits the remarks of those who do take part in the discussion, and discourages others. Where there is a group of papers on one subject, the audience is apt to be wearied before all of them have been read and does not feel inclined to discuss them, and the end of the papers is thereby defeated; for if it were the desire only to obtain the opinions of the authors, this might be done to a wider audience through the technical press.

Through the summer, which is now coming to a close, the usual conventions were held, and the same old plan was followed. The results have been, as usual, disappointing. While many valuable papers have been presented in almost all cases, the discussions have been insufficient and inconclusive, and those attending the meetings have been wearied by the constant pressure necessary to carry through the programme laid out. The experience abroad has been the same, for the foreign journals have been commenting upon this problem, particularly with reference to the recent meeting of the British Association for the Advancement of Science. It can certainly be said that the monthly meetings which certain of the societies hold are more satisfactory for obtaining a thorough discussion of some subject. But even here there is a tendency to overload the meeting by presenting several papers. It has been suggested that conditions might be considerably improved if the papers were not read at all, but presented by titles; but such a plan can not be put into effect until the authors themselves reform. Certainly a paper can not be discussed until it has been read by

him who would discuss it, which can not be done until the paper has been printed. Certain of our technical organizations have, after great efforts, reached the stage where they can demand that the author present his manuscript in time. But even here the way is often difficult, for it is not sufficient to have a paper in type by the time of the meeting; it should be available a week or more ahead.

The simplest way out of the difficulty seems to be to limit the number of papers; thus, one paper presented during a single session is pretty certain to provoke a good discussion, as those interested in it will take the trouble to attend. The plan works well for monthly meetings, but it would hardly do for the general convention. Yet if, of the number of papers which is now frequently rushed through, but one-third was read, the results in many ways would be much more satisfactory, and it is probable that the object for which the society was established would be better promoted. During the month of October the meetings of certain societies will begin again, and it is to be hoped that those who have charge of these meetings will seek rather to excel their predecessors by securing good material and satisfactory discussions than by merely laying out longer programmes.

ILLUMINATION AS AN ART.

In a most interesting and instructive article contributed to the last issue of the ELECTRICAL REVIEW by Mr. Bassett Jones, Jr., a certain phase of the problem of illumination which is frequently somewhat neglected was dwelt upon. Mr. Jones says that the phrase "the art of illumination" is very apt, and he then proceeds to show that the problem of properly illuminating a room or building presents certain artistic requirements which must be fulfilled if the lighting is to be generally satisfactory; that it is not sufficient merely to furnish a certain intensity of illumination throughout the room nor to do this at a minimum cost; the effect produced by the illumination is not only physiological, but psychological, and the latter feature, although it is the one usually most neglected if not entirely overlooked, is really the most important.

It is a rather curious fact that although the providing of artificial illumination is one of the oldest developments of civilization, yet, on the whole, we seem to be very far from having developed an art by means of which we quickly and easily can meet the different problems as they arise. Until recently, illumination of buildings and rooms was provided in a more or less haphazard manner. One person or company provided the light producer, another provided the lamps or fixtures, and occasionally a third designated what the latter were to be and where they should go. No one of the three attempted to make a complete study of the entire problem; each attempted to meet his own little part in the way most satisfactory to himself, and not infrequently the person most concerned—that is say the one who would use the light thus provided—had little or nothing to say in the matter.

It may be safely said that not until after electrical methods of illumination were introduced was anything like a really adequate study of the problem of illumination undertaken, and even then this seems to have been forced upon the electrical companies in order to enable them to compete with other methods of lighting. The necessity brought about a thorough study of one phase of the problem, that of producing and distributing the power used in lighting in the most efficient manner practical. Certainly it must be said that this particular phase of the problem, due to necessity, has been carried to a high stage of development. Yet, strange to say, the lighting companies applied their skill only from the coal pile to the house meter, and any improvement beyond the latter was left to the efforts of others. This is due to the fact that with the types of electric lamps which had been developed a satisfactory business could be secured, in competition with other forms of lighting, and also because any improvement beyond the meter would not directly benefit the supplying company.

Improvements in other forms of lighting eventually, however, made necessary improvements in the electrical systems, and this brought about newer and better forms of lamps. Here again, relatively speaking at least, great advance has been made, yet the providing of a good lamp is only a small part of the general problem of securing good illumination. Two phases of the electric lighting problem thus had made what may be called satisfactory progress, and this statement applies equally well to other forms of lighting, for gas engineers have certainly brought about great improvements in their art. Yet, after the illuminant had been delivered to the consumer, the interest of the supplier in it was lost and the methods by which it was used were ignored. More recently the absurdity of this condition was realized and engineers and others began to study the proper methods of using illuminants, and a fairly good start has been made in this direction. But there seems to be a tendency to over-emphasize certain features of this part of the problem, to the neglect of others, and many are apt to think that that arrangement of the lighting appliances which produces the greatest average intensity of illumination for a given cost, or which produces a given intensity of illumination for the least cost, is the best. It is the error of looking at the problem entirely in this way that Mr. Jones points out. Since the end sought is the pleasing effect on those using the room lighted, he takes the view that the effect produced is more important than a reduction in the cost of lighting. And this effect does not depend entirely upon the average intensity of the illumination; it is more important to have the effects produced by the lighting harmonious with the rest of the room. Even though the lighting produced be agreeable for reading, and although this may be provided economically, yet if the effect upon the occupant is not agreeable, if it does not harmonize with the other features of the room, the installation is a failure; and to meet these requirements the usual training of the electrical engineers is but a poor equipment. It would seem that in some ways the training of the architect should be more suitable, yet it is a strange fact that architects, up to the present time, at least, seem to have ignored utterly the problem of supplying satis-

factory artificial illumination. Not only have they paid no attention to the method of supplying the light other than to say that such a number of places for lamps should be provided, but they have even left the design of fixtures largely to others. The result has been that these appliances have grown out of older types and frequently they are not only artistically bad, but no attempt has been made to take advantage of the peculiarities of the newer types of lamp.

The absurdity of this method of procedure is criticized by Mr. Jones in his article, and he then points out the primary considerations which must govern the design of a lighting scheme. The extent to which these principles are applied will, of course, depend upon the importance of the installation. Yet, even in the simplest problem there are good ways as well as bad ways of supplying light, and a good solution is most easily and surely attained if the correct principles are understood. These principles apply to the selection of fixtures as well as to their location and to the choice of lamp.

In the present state of the art the most difficult question is undoubtedly the selection of the proper sort of illumination. This, as has been said, is the most important phase of the entire problem; but, a solution having been determined upon, the reasons for this must be borne in mind when selecting the types of lamp by which it is to be provided. In selecting the lamps all of their characteristics and peculiarities must be borne in mind. The relative economy of the different types must not be overlooked, yet they must not be allowed to introduce inharmonious effects and thus spoil the entire installation. We are beginning to realize the complexity of these lighting problems and the fact that we have been attempting to solve them by beginning at the wrong end. We are now learning better and will probably offend less in the future; yet it must be borne in mind that to meet all the conditions of a lighting problem is not easy. Even though one appreciate what ought to be done, it does not follow that he will be competent to do it. In other words, not every one who learns a little about photometry and about the best ways of supplying electricity or gas and dabbles a little bit in art, thereby becomes a competent illuminating engineer.

ELEVATORS, ELECTRIC AND OTHER KINDS.

On another page of this issue are published some instructive notes on elevators, contributed by Mr. E. R. Carichoff, who is a recognized expert in elevator matters, and who points out some interesting phases of present elevator practice. The rapidity with which the electric elevator has been adopted is in keeping with the rate at which the electric motor has been introduced for other kinds of work. But, in spite of this, one frequently hears unjust criticisms of the electrical system go unanswered. Hydraulic engineers are accustomed to say that even though the electric elevator has certain advantages, the hydraulic type is safer. Mr. Carichoff, however, points out that there is no sound reason for this assertion, and that certain of the hydraulic types are no safer than the electric, since the same kind of accident will produce disaster with both. For example, the hydraulic device, it is said, can not overtravel and thus break the ropes carrying the car, because the piston will come up against the head of the cylinder. They overlook the possibility that the piston may drive out the cylinder head, in which case they would be no better off than if the ropes had broken. Moreover, it is an easy matter to apply an attachment to the electric elevator which will just as surely stop the motor before the car is brought up against the head frame as will the hydraulic piston be stopped by the cylinder head. Hydraulic engineers seem to overlook the fact that an electric elevator is different from other types merely in the way in which power is applied, and that although the hydraulic power can be used economically in but a few ways, the method adopted to utilize hydraulic power for moving the car can be applied by means of an electric motor, and with the latter other methods are also available. For example, the hydraulic elevator is most usually applied through ropes and sheaves, if the travel of the car be at all great. Yet this same method of transmitting motion from the electric motor to the car has been and still is being used. Recently a new hydraulic elevator has been introduced which is put forward as being absolutely safe. This is the so-called "plunger" type, which while not new, is new in its application to high lifts. To him who is not an engineer there may be some satisfaction in riding in a car supported apparently by a rod of steel many inches in diameter, yet this apparently solid support is nothing more than a long jointed pipe, and it certainly does not seem mechanical to support a heavy weight on a column 500 or 600 feet in length without any lateral supports between the top and base. This objection is overcome by over-balancing the car and using the plunger mainly as an arm for transmitting motion from the hydraulic cylinder to the car; yet, as Mr. Carichoff says, it is hard to see wherein such an arrangement is safer than the simple rope lift; because, should the counterweight ropes break, the whole weight of the car must be borne by the plunger.

Another false claim frequently used in favor of the hydraulic elevators is pointed out by Mr. Carichoff. This is the assertion that the hydraulic machine is much more economical than the electric, and to prove this a hydraulic engineer charges against his hydraulic machine only the cost for the steam required in excess of that needed for heating the building, while he charges against the electrical machine all the energy used, as measured by the meter, and at that rate at which it could be purchased from a supply company. In other words, he charges the electrical system for depreciation, repairs, interest and attendance at the generating station or the local plant, while these items are overlooked in considering the hydraulic device.

The popularity of the electric elevator may be attributed to several features. One of these is the rapid service which may be given; another, the ease of control, which may indeed, be made practically automatic. These features, taking into consideration the recent statement by a British authority that an electric elevator properly designed is as safe as any other, seem to indicate that it will maintain its leading position.

NOTES ON ELEVATORS.

BY E. R. CARICHOFF.

It is very interesting to note that some distinguished English experts consider the electric elevator to be as safe as the hydraulic elevator and estimate that in general the cost of operating electric elevators is about one-fifth as much as the cost of operating hydraulic elevators.

The electric elevator referred to in this comparison is undoubtedly the winding-drum type, the fundamental principles of which have been discussed in the ELECTRICAL REVIEW (Vol. xlvi, p. 1006, and Vol. xlvii, p. 380). Safety is of course the first requirement of any elevator, and after this efficiency of service, cost of operation and maintenance may be considered. Smoothness of running and stopping seem essential to some, so that real efficiency of service is sometimes sacrificed to obtain smoothness.

Although electric elevators largely predominate numerically over all others, and are growing into still greater favor, the hydraulic elevator is preferred by some. It is worth while to inquire whether there is any just reason for a preference for the hydraulic elevator.

The only reasonable objection in point of safety to the winding-drum electric elevator is that it may overdrive and send the car into the overhead works and either break the hoisting ropes or pull them from the fastenings; or, on the other hand, drive the counterweight into the overhead works, break the ropes and allow the weight to fall and probably injure the occupants of the car.

Such things have happened, due to faulty design and construction, but these have largely been eliminated in the newer installations. Likewise similar things have happened to hydraulic elevators. In one case, due to a break in the piping, the water left the cylinder and the car was jerked against the overhead works and fell the full height of the building.

It is probable that what remaining prejudice exists in favor of the hydraulic elevator, is due to the fact that this type was the first to reach a point of high development. Smoothness seemed easy of attainment with the hydraulic, while the electric elevator has almost always been more or less jerky at times. This occasional lack of perfect smoothness does not interfere with prompt service, which is a prime consideration for people in a hurry, and with care any desired refinement of control may be had.

Some years ago it was held that the hydraulic elevator possessed a superior element of safety in the fact that the piston of an hydraulic elevator was stopped mechanically in a positive manner by the ends of the cylinder and the connected car could not be driven into the overhead works.

To meet this position squarely, F. J. Sprague built an electric machine in which a nut traveled on a screw within positive mechanical limits, the movements of the nut corresponding to the movements of the car.

It is clear to engineers that this machine exceeded the hydraulic in point of safety: it possessed the same variations of speed, and its cost of operation was considerably less than that of the hydraulic under the same conditions of power supply. The maintenance cost, however, was excessive, and because its development was arrested, there was no opportunity to show the best results that could be attained with this form of construction. But latterly vast improvements have been made in both nut and screw, which have shown a very reasonable maintenance cost over a number of years. Improved controllers also were installed in some plants, and in one building that I know of there has not been a stoppage of an elevator caused by controller trouble for a period of more than three years. Besides, the cost of upkeep on these same controllers is almost nothing. In the same building there are some new hydraulic elevators, and unprejudiced engineers would find difficulty in deciding which give the better service.

For a type of electric elevator arrested in development to equal in service the fully developed hydraulic shows to what end the electric elevator is tending.

The Sprague screw machine has multiplying sheaves in which the ratio of multiplication is often as much as sixteen to one, including the sheaves in the hoistway, while the hydraulic elevator usually has a ratio of multiplication which varies from eight to one to two to one.

Pulley blocks are good things in their place, but to reverse the use of pulley blocks and to hang a car on the free rope or ropes of the pulley blocks and to attach one sheave block to the slow-moving piston of an hydraulic cylinder or to the traveling nut of a long screw is permissible only when no better form of gearing than rope gearing can be used.

Recently there has come into great favor a type of hydraulic elevator, by no means new, called the plunger elevator. The car is supported on the end of a long ram which descends into a cylinder built in the earth the whole distance of the travel of the car. Ropes lead from the top of the car over sheaves to a counterweight which serves partly to balance the weight of the empty car and its ram.

This elevator is declared to be so safe that no safety grip is necessary under the car. The construction is very simple and has much to commend it mechanically for short lifts, such as sidewalk elevators, where a small pumping plant would suffice, but it is now proposed by its strongest advocates to use this type for forty-story structures.

Truly, it seems like relying on Providence for safety when it is proposed to poise a heavily loaded car on the end of a thin, wobbly pipe, 500 feet long, and to shoot it up by hydraulic pressure vertically 500 feet into the air with no guides for the pipe except at the top and bottom ends and with no safety grip under the car. Suppose the pipe does not wobble enough to collapse as long as the car is partly supported by its rope-hung counterweight; if the ropes break what would prevent a collapse of the car? But it is said the counterweight ropes will not break; if so, where in point of safety, is this construction superior to a rope-hung car with no stick under it? Ropes are very reliable things and should never break at all on an elevator. But if an elevator overdrives the ropes may be broken or pulled out when the car strikes the overhead works.

The plunger elevator is only one form of construction that will not overdrive, and this quality is obtained at enormous expense for high rises without one added feature of merit and with some of demerit.

Evidently the English experts think that the danger of overdriving is eliminated with the ordinary drum machine, or they would not have pronounced it equally safe with the positive stop hydraulic machine.

The first electric elevator is said to have been built by Siemens & Halske, of Berlin, for the Industrial Exhibition at Mannheim in 1881. A motor placed under the car drove through suitable gearing two pinions which meshed in the teeth of racks in the hatchway, thus causing the car to climb up and down, according to the direction of rotation of the motor.

Place the same motor on the counterweight frame and have the counterweight climb up and down long racks, pulling the car by a rope, and we have a type not long since installed in the Chicago Board of Trade Building. Place the motor in the basement of a building, drill a hole as deep as the building, place a car on the

end of a long rack reaching to the bottom of the hole, and drive the rack up by the motor pinion and we have the oldest type of electric elevator by a slight transformation built to imitate the popular hydraulic plunger elevator. Does any one want an electric elevator built that way?

For the rack and pinion we may substitute a long screw and nut, and for purposes of safety and to avoid a collapse of the screw when used under compression like the hydraulic ram, we may connect the screw to the counterweight and place the screw under tension. It will work beautifully, be economical, and not require a great expensive pumping plant to operate it.

The worm-gear, drum electric elevator is much the cheapest and simplest form of elevator, and the large number of such in use is proof of the statement. With careful design of machine and controlling apparatus it can be made to give perfectly satisfactory service. For very tall buildings, a drum of abnormal dimensions would be required; so to avoid this, a form of construction called the traction elevator has recently come into use. Instead of a drum with ropes anchored to it, a driven and an idle sheave are used and the car ropes are looped over these two sheaves, making a form of drive similar to that used to drive the cable of the old-time cable railway. The machine may be placed at the bottom of the hoistway or over the hoistway, but when placed on top only about one-third as much rope is required as when placed underneath.

The use of one driven sheave and one idle sheave allows two half turns, or more if necessary, to be taken around the driven sheave, and thus affords the required friction for driving with a minimum of slippage of the ropes on the sheave and a consequent reduction in rope wear.

This is a form which I proposed about four years ago when experiments were being tried with other methods of getting the required friction for driving.

I also proposed, at that time, that gears be used between the motor and the sheave so that a reasonable motor speed could be employed, but the practice is still to use a motor making less than 100 revolutions per minute maximum.

If gears are interposed a variable field motor would become practicable and more satisfactory operation and greater economy would result where frequent stops are made. I am glad to see that after trial of other forms of controller, the form that I proposed at that time has recently been adopted.

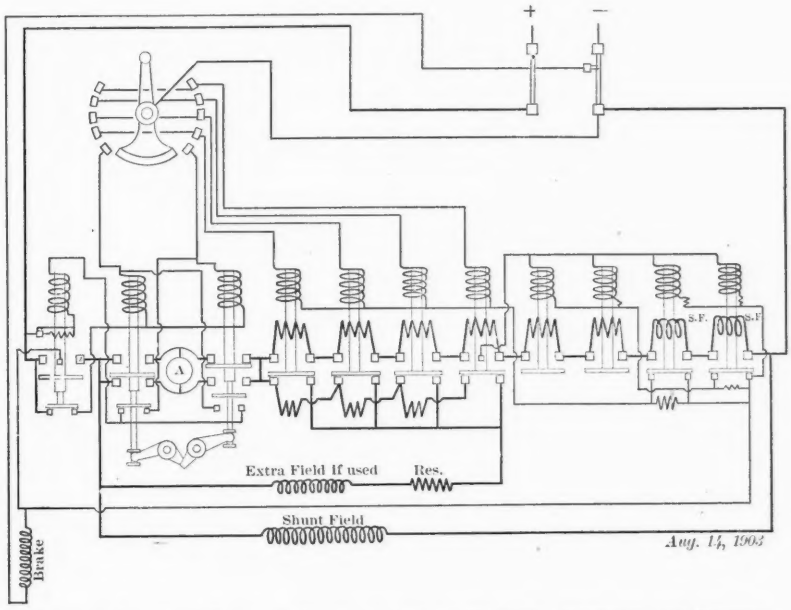


DIAGRAM SHOWING GENERAL ARRANGEMENT OF MAGNETS, SWITCHES AND CIRCUIT CONNECTIONS FOR ELEVATOR CONTROLLERS.

A diagram herewith shows the general scheme, which is to have several magnet switches to control a shunt resistance around the armature and a resistance in series with the armature at the same time to get the required low speeds—these switches being controlled from the car—and a series of accelerating magnet switches controlled by the counter electromotive force to cut out the additional armature resistance for full speed.

A traction elevator designed along the lines I have suggested, with its controlling mechanism, forms about the simplest conceivable form of electric elevator for high-speed service in tall buildings. Its consumption of energy per car-mile of travel should be about one-third as much as that of the best form of hydraulic elevator, and I believe it can be installed for much less money, and that it will give more prompt and satisfactory service than the hydraulic. The masses to be started and stopped are very much less than those of the plunger elevator.

The moving masses at car velocity in the case of a plunger elevator of 282 feet rise are more than 22,000 pounds, while the moving masses at car velocity of a traction elevator should be less than one-third of this.

The underbalance for the same plunger elevator is given at 2,135 pounds, and with a load of 1,617 pounds in the car, or a total net load on the plunger of 3,752 pounds, running at 490 feet per minute, this elevator required twelve feet four inches to stop in and lost eight and one-half seconds in getting back to the landing. These figures are from the February number of the Proceedings of the American Society of Mechanical Engineers.

Think of a system that requires 2,135 pounds weight to be lifted at car-speed, exclusive of all passengers, for no other purpose than to stop the car when the water pressure is turned off! Even with this weight for stopping, the distance required is two or three times that required by a properly controlled traction elevator. Clearly, in promptness of service the traction elevator is far ahead of the plunger, or indeed any form of hydraulic elevator.

The energy consumption of an office building hydraulic elevator is the equivalent of about eight kilowatt-hours per car-mile of travel. The traction elevator will run with three kilowatt-hours per car-mile, or less, if the stops are not too frequent. There is a saving in energy of five kilowatt-hours per car-mile, or 100 kilowatt-hours for an elevator making twenty miles per day. At a low cost of say three cents per kilowatt-hour, the saving per elevator per day is $3, or about $900 per year. For a plant of ten elevators this saving is $9,000 per annum. The additional expense on account of more rope wear on the traction elevator would be only a very small part of this great saving.

Besides, in the original cost of the installation, the traction elevator is much

cheaper, and this is also true of the power plant.

There are some cases in large buildings where economy of operation is of no consequence during the winter months, since the steam required for heating purposes may be more than is necessary for all power purposes. But, of course, this does not apply during the summer months, when a part of the steam plant may be shut off. It may even be found more economical to shut off the entire plant in the building and run the elevators from the street service. Then an economical plant would be desirable. Special cases, of course, require special study.

The development of the electric elevator has no doubt been largely retarded by the difficulties attendant upon the design of satisfactory controlling devices. Some of the early controlling devices, viewed from the present stage, seem little less than monstrous crudities.

When I went with the Sprague Elevator Company, in 1893, the controller for the long-screw machine was supposed to be complete, as it had some of the best experts of the time contributing towards its design. This controller consisted of a long wood cylinder with numerous blocks of copper attached, over which a carbon brush was moved spirally by a pilot motor. Wires led from the contact blocks to iron or German silver ribbon resistances. To keep down the arc due to breaking the current, the total resistance was made high and delay occurred in starting the elevator until the brush-arm traveled far enough to admit full starting current for the motor. There was objection, also, on the part of the New York Edison Company, to any device that took instantly a large current at frequent intervals. It was said that the first current should be small and this should be gradually increased to full motor-starting current. Prompt starting was, of course, impossible with such restrictions.

After the mechanical form of circuit-breaker came the magnet switch and carbon contacts, until at the present time almost all electric elevator controllers are made of a collection of magnet switches variously arranged with various forms of contacts.

The form of magnet is generally that with a moving plunger which carries the contacts and enters the winding of the coil.

The advantage of such a form, with full description, was given by the writer in the *Electrical World* in 1894, and this remains the approved form to the present day, both for elevator-controlling devices and for railway-controlling devices of the multiple-unit system.

Amalgams.

In this one of a series of articles on alloys, A. H. Sexton describes the amalgams, these being merely the alloys of mercury with other metals. Mercury is unique in being the only metal liquid at ordinary temperature. It freezes at minus 38 degrees Centigrade and boils at 360 degrees Centigrade, but at much lower temperatures gives off vapor. These alloys differ in one respect from those of the other metals because they are used and studied at a temperature about the melting point of one of the constituent metals. They may be either liquid, solid or pasty, according to the quantity of mercury which is present, and the nature of the other metal. Mercury alloys with or dissolves almost all metals, the alloy with gold readily forming a white amalgam. A definite amalgam seems to be formed as any excess of mercury may be strained out through a fine fabric. The mercury may be separated from the gold by distillation. A definite solid amalgam may be formed which contains about fifty per cent of gold. Mercury dissolves silver, forming amalgams closely resembling those of gold. The silver is dissolved less readily than gold when cold, but very readily when heated. A definite amalgam is also formed with this metal which crystallizes when solid. Copper and mercury unite when finely divided copper is mixed with mercury. Generally these amalgams are prepared chemically. An amalgam containing from twenty-five to thirty per cent of copper may be formed, which has a consistence of clay, but on being left to itself for a few hours, sets. It can be broken up again into mortar, and upon warming, reassumes the plastic form, and this change may be repeated indefinitely. Mercury and tin unite readily at ordinary temperatures. The former metal quickly penetrates the latter, making it brittle and causing it to expand. It is this alloy that is used for silvering the backs of mirrors, as it can be pressed into optical contact with the glass. A tin amalgam is used in dentistry which sets upon standing. To such cements cadmium is often added. Sometimes silver, gold and tin are used for preparing amalgams for dental purposes. Sodium combines readily with mercury at ordinary temperatures, heat being involved during the reaction. These amalgams are used freely in chemistry as reducing or hydrogenating agents, hydrogen being set free when they are brought in contact with water. Nickel, cobalt, iron, manganese and platinum do not readily alloy, but this can be brought about by the action of sodium amalgam on a solution of the metals.—*Mechanical Engineer (London), August* 24.

The Canadian Street Railway Convention.

The convention of the Canadian Street Railway Association was held at Montreal, Quebec, at the Windsor Hotel, September 12 and 13. An executive session was held on the morning of September 12, the attendance including representatives of all the principal electric railways of the country. Among those present were J. R. Hutchison, superintendent of the Ottawa Street Railway Company; A. F. Townsend, manager of the Cape Breton Street Railway; Hon. Senator McKeen, president of the Halifax Railway; J. W. Crosby, manager of the Halifax Railway; H. N. Bartlett, superintendent of the Quebec Railway, Light and Power Company; G. C. Royce, manager of the Toronto Suburban line; W. Phillips, manager of the Winnipeg Street Railway, and Acton Burrows, secretary-treasurer of the association.

At the morning session a discussion of track construction, maintenance of way and rail welding was taken up. The afternoon session dealt with the question of motive power and overhead equipment.

The closing session of the convention was held on the morning of September 13. This consisted of an informal discussion of motive power, rolling stock, overhead equipment, traffic, purchasing and accounting.

There was no election of officers, as the present board was elected at the annual meeting last May. The president, Edward A. Evans, general manager and chief engineer of the Quebec Railway, Light and Power Company, presided over each session.

The Annual Reunion of the Old Time Telegraphers' and the Society of the United States Military Telegraph Corps.

The annual reunion of the Old Time Telegraphers' and Historical Association and the Society of the United States Military Telegraph Corps, which was fixed for September 16, 17 and 18 at Niagara Falls, N. Y., has been postponed until next year, when it will be held at the same place on a date to be fixed by the executive committee. This action has been taken after full consideration by the committee in conference with the officers of the respective organizations.

Economical House Lighting.

By Van Rensselaer Lansingh, Illuminating Engineer.

(*Concluded.*)

KITCHEN.

The method of lighting this room is clearly brought out in Fig. 10.

A single light is placed close to the ceiling with a broad distributing reflector and controlled by a wall switch near the entrance. This provides sufficient general illumination for the kitchen and is in such a position that the range, which projects out into the room, is well lighted, thus doing away with the necessity of having a special light over the range. The place where illumination is most needed is over the sink. If a centre outlet only is used, one always stands in his own light so that the only illumination falling on the dishes is that reflected from the walls and ceilings, which is, generally speaking, insufficient to properly see whether or not the dishes are clean. To overcome this, a wall bracket pointing straight down is used with a concentrating reflector, the wall bracket being controlled by a pull-socket. A four-candle-power lamp is used, giving ample illumination for the purpose. This is turned off when the sink is not in use, with the result that most of the time the single twenty-candle-power lamp in the centre is sufficient for lighting a fairly good-sized kitchen.

FIG. 10.—SHOWING LIGHTING OF KITCHEN.

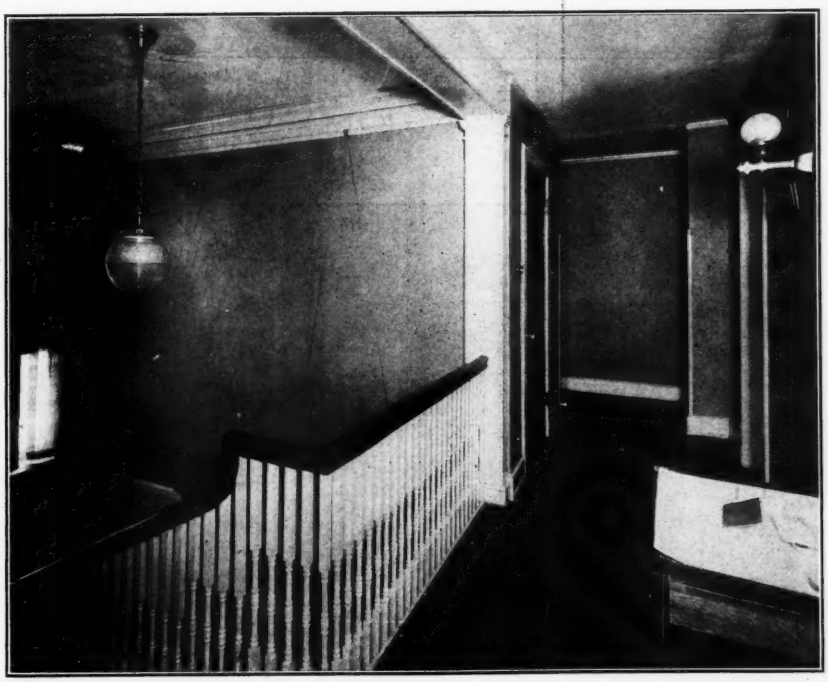


FIG. 11.—SHOWING LIGHTING OF UP-STAIRS HALL.

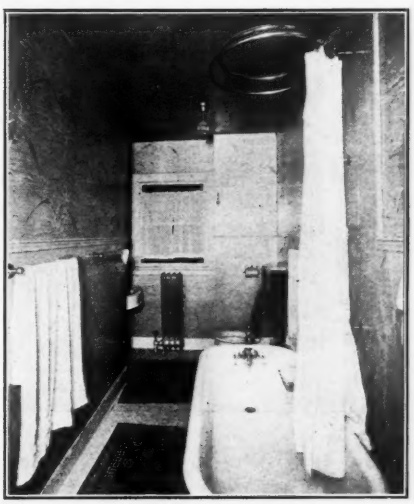


FIG. 12.—SHOWING LIGHTING OF BATH ROOM.

UP-STAIRS HALL.

The lighting of this is well shown in Fig. 11. At the far right is an upright bracket equipped with a pull-socket and a four-candle-power lamp. This is a long-burning outlet, inasmuch as the light is burned from dusk until the family goes to bed and, therefore, is equipped with a low-candle-power lamp, which, however, gives ample illumination for the purpose. The stairway proper is lighted, as shown in the photograph, with a single large ball in which is placed a sixty-candle-power Tungsten lamp, which floods the hall with light. This is controlled by three-way switches at the top and bottom of the stairs, but is not used on ordinary occasions, inasmuch as the light at the foot of the stairs, shown in Fig. 3, and the one at the right in Fig. 11, are ample

FIG. 13.—SHOWING LIGHTING OF BED ROOM.

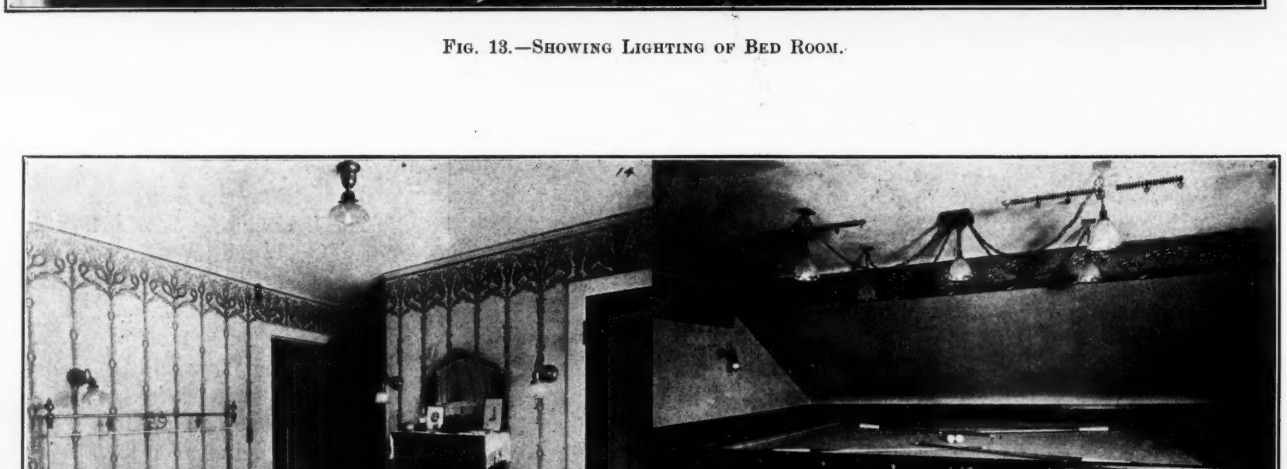


FIG. 14.—SHOWING DRESSER LIGHTING.

FIG. 15.—SHOWING BILLIARD TABLE LIGHTING.

to light the stairway for general use. The use of such a high-candle-power lamp in such a place is unnecessary, but as the total consumption of the lamp is only eighty watts, its use is justified for special occasions.

BATHROOM.

The lighting of a bathroom can be done in one or two ways. If the room is to be used for shaving purposes, it is desirable to place a four-candle-power lamp on each side of the mirror, whereas if the light is to be used simply for general illumination one placed as shown in Fig. 12, equipped with a proper reflector, is all that is necessary.

An eight-candle-power lamp for a bathroom, which is generally light in color, is sufficient. The control of such a light should, of course, be by a switch placed close to the door.

BEDROOM.

Fig. 13 shows a good method of lighting a bedroom. In this case three lights are used close to the ceiling and controlled by a wall switch placed close to the door. Inasmuch as the walls and ceiling are light, eight-candle-power lamps are ample for good illumination. Over the bed is placed a bracket with a long pull-socket equipped with a concentrating prismatic reflector and a four-candle-power lamp. This furnishes excellent light to read by and also a light which can be turned on at any time during the night if necessary. The long chain to the pull-socket makes it very easy to find in the dark. It should be noted that the light is placed at such an angle as to throw the light directly down over the head of the bed, in this case about twenty degrees from the vertical.

As will be seen from Fig. 13, the closet is lighted from a single upright light which can be equipped with a bare, frosted lamp and pull-socket.

Fig. 14 shows another bedroom and the method of lighting the dresser. On each side is an eight-candle-power lamp with a pull-socket, equipped with glassware which throws the maximum light on the face of a person standing in front of the mirror. The brackets are made to swing so that the lights can be brought to practically any position desired. The single lamp in the centre of the room placed close to the ceiling is sufficiently high to light the top of the head of any one standing in front of the mirror, making a light over the centre of the mirror, which would otherwise be required for perfect lighting, unnecessary. It will be seen that this room is provided with no less than four lamps, but the running cost of the same is low. In the first place, the light over the bed and the lights on each side of the dresser are never turned on unless they are specially wanted, and the general illumination, which is more than ample for most purposes, is provided by the single twenty-candle-lamp on the ceiling.

BILLIARD ROOM.

In a private house where there is only one table it is desired to have the main lighting fixture not only throw sufficient light on the billiard table, but also to properly light the room so that the counting string can be easily seen. If opaque

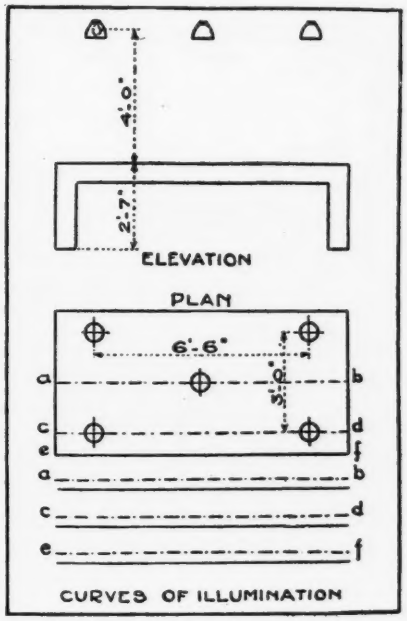


FIG. 16.—PLAN OF BILLIARD TABLE LIGHTING.

reflectors are used, other lights must be provided for this purpose.

Fig. 15 shows the billiard-table lighting. It will be noted there are five lights placed in very deep bowl prismatic reflectors, which allow sufficient light to pass through to properly illuminate the counting string and room. These lights are arranged as shown in Fig. 16 and placed four feet above the table.

On account of the depth of the reflectors the lamps themselves are invisible unless one looks directly upward so that the glare from the same is entirely eliminated. Owing to the distribution which these reflectors give and the placing of the same, the lighting of the table is remarkably uniform, the corners being as well lighted as the centre, a point which is usually overlooked. This is especially important inasmuch as most of the playing is done in the corners rather than the centre of the table. Fig. 16 also shows the illumination curves in three different planes.

It will be seen from the foregoing photographs, which show typical installation of lights in this twelve-room house, that good, artistic results were obtained and that the lighting, owing to the careful arrangement of switches, pull-sockets, candle-power of lamps, glassware selected, etc., is remarkably efficient, the running cost, as before stated, never having exceeded $9.60 in a month, which includes the cost of doing most of the ironing by electricity.

New York Subway Exempt from Franchise Tax.

In a decision handed down on August 27, Supreme Court Justice Fitts held that the Interborough Rapid Transit Company need not pay special franchise taxes for operating the subways of New York city. Justice Fitts decides that the city of New York is the absolute owner of the underground railway, including not only the tangible property, but the franchises as well. Both of these were leased to the company by the city, he finds. Justice Fitts holds that the amended tax-exemption section of the Rapid Transit act exempts the franchises as well as property from tax.

The decision is the result of certiorari proceedings brought by the Interborough to review the action of the State Board of Tax Commissioners in fixing, in 1905, the special franchise valuations of the company for operating the underground railway at $9,000,000. These proceedings were begun about a year ago and were argued for the state by Deputy Attorney-General Graham. In 1906 the state commission fixed the valuations at $18,000,000, and in 1907 at $24,000,000.

Ontario's Rich Mica Mine.

Consul H. D. Van Sant reports that at Sydenham, Ontario, sixteen miles from Kingston, is located the largest mica mine in the world. The product is mostly amber mica, with some silver amber, the highest quality mined. The mine is one mile from the upper end of Sydenham Lake, and the mica is transported in bulk from the mine by barge to the railroad at Sydenham, where it is shipped to Ottawa for trimming for the market. From Ottawa it is exported to the United States and other points. This valuable mine is owned and worked by Americans, and the output is almost entirely taken by one of the largest American electric companies.

The Canadian Electrical Exhibition.

Montreal, Que., September 2-14.

TOGETHER with the annual conventions of the prominent Canadian electrical associations, the Canadian Electrical Exhibition held in the Drill Hall, Montreal, under the auspices of the Canadian Electrical Exhibition Company, Limited, from September 2 to September 14, as a first attempt at anything of this magnitude in Canada, proved an unqualified success.

Although the show opened to the public on Monday, September 2, the official opening took place on the Thursday evening following, when Premier Gouin, of the province of Quebec, with leading officials of the city, attended.

While the weather during the first three or four days was unfavorable, the attendance later in the week and during the last week was in every way satisfactory, both to the management and to the exhibitors.

The visitors were unanimous in expressing their appreciation of an exceedingly pretty and instructive display, the exhibitors received substantial returns and the show as an annual feature is assured.

To the officials of the show, W. McLea Walbank, president; J. W. Pilcher, secretary-treasurer, and R. S. Kelsch, managing director; and to Managing Director Kelsch's assistants, Messrs. Nelson, Walsh, Benoit, W. B. Kelsch, Hulburt and Miss Gibson, much credit is due for their untiring efforts and for courteous attention to the needs of visitors and exhibitors alike.

The Economical Electric Lamp Company, New York city, made demonstrations of its turn-down lamps. M. Lobenthal, vice-president of the company, with several assistants, were in attendance.

The Fibre Conduit Company, of Orangeburg, N. Y., showed samples of fibre conduit. Represented by Sales Manager W. K. Sparrow and J. M. Nelson.

Egbert Reynolds Dull, managing partner of the Reynolds Dull Flasher Company, of Chicago, with whom the exposition company contracted to set up the "dancing skeleton," was present during the two weeks of the show with a number of the company's flashers, operating various signs.

Benjamin clusters and lighting specialties was exhibited at the booth of the Montreal Light, Heat and Power Company. George C. Knott, of the Benjamin Electrical Manufacturing Company's Toronto office, was in attendance.

The Canada Electric Company, of Montreal, exhibited a fine line of fixtures and bell systems, and was ably represented by Alphonse Doray and Maurice Pelletier.

C. P. Edwards and R. Renouf were the operators in charge of the Marconi station.

In attendance at the booth of G. M. Gest, of New York and Cincinnati, were G. M. Gest and W. Hentschel.

Pictures of the company's plants in Chicago were shown in the Chicago Edison Company's booth.

Samples of its wire were exhibited by the Eugene Phillips Electrical Works, of Montreal. George H. Olney, secretary and treasurer, L. Mead and T. J. Corbett were in attendance.

The Canadian Buffalo Forge Company exhibited in operation an electrically driven fan, connected to an air-washer and humidifier. Represented by E. J. Brown.

Bituminized fibre conduit was displayed by the American Conduit Company. R. R. McDonald was in charge of the exhibit.

The more prominent features of the Canadian General Electric Company's large exhibit were incandescent lamps in every stage of manufacture; prepayment or dime-in-the-slot meters; a complete line of switchboard and portable instruments connected up; single-phase and three-phase alternating-current motors in operation; electric kitchen—attracting crowds—everything cooked electrically before visitors and served; mercury arc rectifiers; flaming arc lamps.

At the National Electric Lamp Association's exhibit there was to be seen a fine exhibit of tungsten, tantalum, Gem metallized filament lamps and Holophane glassware. This striking exhibit was made by the Sunbeam Incandescent Lamp Company of Canada, Limited, and the Holophane Company, through the engineering department of the National Electric Lamp Association. On the top of the pillars at the corners of the booth were large electroliers, holding tungsten eighty-candle-power, 100-watt lamps; new type tantalum Meridian lamps, operating at two watts per candle, and 250-watt Gem Meridian lamps. Surmounting these electroliers, was an arch frame-work on which were displayed sixty-three forty-candle-power tungsten street series lamps. Between the corner posts were rows of tungsten, tantalum and Gem lamps. At the back of the booth was a large case containing eighty-four tantalum miniature lamps.

Among the National men in attendance at the exposition and at the meetings of the Canadian Electrical Association were B. G. Tremaine; S. E. Doane, chief engineer; E. Irving, of the Sunbeam Incandescent Lamp Company of Canada, Limited; V. R. Lansingh, of the Holophane Company; Lee Loring of the Engineering Department; L. Merrill; T. W. Rolph. The booth was in charge of W. M. Skiff, of the engineering department.

A Stratton engine in operation attracted attention to the booth of the Stratton Engine Company, of Fitchburg, Mass. A. D. Macaulay was in charge of the exhibit.

At the booth of John Forman, of Montreal, were exhibited among other lines: Connecticut telephones, American transformers, Chase-Shawmut cutout blocks and fuses, Alphaduct flexible conduit, American Electrical Heater Company's heating devices, Lima porcelain insulators, Brookfield glass insulators, and Sangamo meters.

R. C. Lanphier, general manager of the Sangamo Electric Company, Springfield, Ill., was in attendance during the first week.

J. A. Dawson & Company, of Montreal, had a booth near the entrance, at which were shown Crouse-Hinds headlights, Consolidated car-heating apparatus, Macallen insulating joints and Hill electric switches. Messrs. Dawson, Lewis Allen and Warren in attendance.

A working exhibit of a Robb-Armstrong engine direct-connected to a General Electric generator, was exhibited in the booth of the Robb Engineering Company, of Amherst, Nova Scotia.

The Shawinigan Falls Power Company had a nicely decorated booth showing pictures of its water-power plants at Shawinigan Falls.

The Northern Electric Manufacturing Company, of Montreal and Winnipeg, occupied large space, exhibiting telephone and fire-alarm apparatus. Represented by

Messrs. Murdock, McGillivray, Miller and Genois.

P. R. Fisher, western sales manager of the Condit Electrical Manufacturing Company, of Boston, showed his company's circuit-breakers at the booth of the Northern Electric Manufacturing Company.

A booth of general interest to the layman was that of the Montreal Light, Heat and Power Company, whose exhibits of electrically operated domestic appliances attracted much attention.

The Bell Telephone Company, of Canada, which furnished free telephone service for exhibitors, showed a board in operation. The booth was in charge of D. O. Clarabut.

The Canadian Rand Company, of Montreal, was represented by M. H. Woods and S. W. Dugan.

Aluminum conductors and bus-bars were displayed by the Northern Aluminum Company, with Mr. Hamilton in charge. Percy Hodges, Boston manager of the Aluminum Company of America, of which the Northern is a subsidiary company, was also in attendance.

Among the interesting exhibits was that of Fred Thomson & Company, showing wireless sending apparatus and induction effects; also practical demonstration of armature winding. Fred Thomson, Clarence Thomson, Harry McPhee, T. Harry Letts, Joseph La Croix and Arthur Darling were in charge.

The Garth Company showed iron fittings and gas and electric fixtures, with J. R. Meadowcraft and J. Willock in charge.

Belliss & Morcom, of England, manufacturer of engines, and Laurie & Lamb, of Montreal, its Canadian representative, occupied a booth jointly. Albert Laurie and Wayland Williams were in attendance.

Electric signs were displayed by the Martel Stewart Company, of Montreal.

Mica for electrical purposes comprised the exhibit of the A. Roy MacDonald Mica Company, of Montreal.

A complete line of fixtures, supplies and accessories was shown by Munderloh & Company, of Montreal.

The Linde British Refrigerator Company, of Canada, exhibited the Linde ice machine.

An interesting line of Duntley electrical tools, manufactured by the Chicago Pneumatic Tool Company, was exhibited by the N. J. Holden Company, of Montreal.

Trucks for electric street railways were shown at the booth of the Montreal Steel Works Company.

A good showing of Jandus interchangeable arc lamps, together with Crocker-Wheeler apparatus, and American instruments, for which the Packard Company is Canadian agent, was here shown. The company was well represented by the following: George C. Rough, agent, sales department; R. A. Stinson and F. Jno. Bell, managers Montreal office; J. E. Ryan and Fred Wilkinson, electrician.

C. L. Eshelman, secretary of the Jandus Electric Company, Cleveland, Ohio, was in attendance throughout the show.

Dossert & Company, New York exhibited a line of solderless connections, approved by the National Board of Fire Underwriters. Among the new devices shown, were an emergency third-rail clamp made for the New York Central lines, and a special rail clamp for the block-signal system. J. J. Dossert and E. A. Dossert were in attendance. Negotiations for the sale of patent rights and the manufacture of the goods in Canada are nearly completed.

The "Vulcan" electric soldering and branding tools were prominently displayed in the exhibits of the R. E. T. Pringle Company, the Montreal Light, Heat and Power Company and the Sawyer Electric Company. F. J. Holmes, president of the Vulcan Electric Heating Company, Chicago, Ill., was in attendance.

The Westinghouse companies showed a 1,500 horse-power, 600-volt, direct-current, railway type generator, built for the Montreal Street Railway, to be installed in the latter company's new power-house at Hochelaga. A 2,500-kilowatt, 46,000-volt transformer, mounted on a large base, was also one of the prominent features of this exhibit. A most interesting feature of the exhibit was a static sign operated at a potential of 60,000 volts, illuminating in lightning-like flashes the word "Westinghouse." Among the smaller items of this exhibit was a variable-speed, alternating-current motor of fifteen horse-power, complete, with its reversing controller operating continuously, and a line of various sizes of induction motors, ranging from five to fifty horse-power.

The Midland Electric Company showed a fine line of fixtures and supplies.

The Babcock & Wilcox Company entertained visitors in a well-appointed booth.

John S. Lapp, secretary and treasurer of the Locke Insulator Manufacturing Company, came up from Victor, N. Y., to attend the exhibition. His company occupied a well-located booth near the entrance of the hall, and displayed a line of the well-known Victor insulators. The feature of this exhibit was the 100,000-volt insulator which was one of those made for the Stanislaus Electric Power Company, of California, for 150 miles of transmission, which will be the first 100,000-volt commercial transmission in the world.

The Wire and Cable Company, of Montreal, had in attendance Messrs. Thornton, Curtin, Hutt and Blatt, and showed a line of wires, cables and cords, with a braiding machine in operation in the making of weatherproof cable.

The Standard Paint Company, of Canada, showed its well-known P. & B. products for insulating purposes.

Messrs. Johnson and Barbeau represented the Canadian Fairbanks Company, who showed a gasolene engine, pump, motors and generators. The Yale & Towne Manufacturing Company was also represented at this booth.

A pretty booth, the first to pass on entering and last on leaving, was that of the Sawyer Electric Company.

An exhibit which received a good deal of attention was the very complete working exhibit of the Allis-Chalmers-Bullock Company. Pictures of its manufactures were displayed, and besides its own products Wagner motors were exhibited. The company also showed a winding department, having in a separate booth a number of girls from the factory and showing the actual building up of their induction motors. The exhibit was in charge of Irving Smith, the company's sales manager, who was assisted by P. M. Walker, D. W. Massie and several young ladies.

G. A. Thomson, New York agent of the Adams-Bagnall Electric Company, was in attendance at the booth of the R. E. T. Pringle Company, where Adams-Bagnall lamps were exhibited.

The exhibit of the R. E. T. Pringle Company, Limited, attracted attention. The display of sockets, rosettes and receptacles was very complete. The company represented the following manufacturers: Faries Manufacturing Company, Decatur, Ill., fixtures; Lemanquais Electric Manufacturing Company, Belle Mead, N. J., sectional panel boxes; Proctor Raymond Manufacturing Company, Detroit, Mich., electric bells; Standard Appliance Company, Chicago, Ill., soldering material; Adams-Bagnall Electric Company, Cleveland, Ohio, arc lamps; Beck Flaming Lamp Company, flaming arc lamps; Francis Keil & Son, push buttons and letter boxes; Prometheus Electric Company, New York city, cooking apparatus; Moloney Electric Company, St.

Louis, Mo., transformers; Electric Goods Manufacturing Company, telephones.

The working exhibit of the Vulcan Electric Heating Company, of Chicago, was personally conducted by the president, F. J. Holmes, who demonstrated a line of soldering and branding irons.

The working exhibit of the D & W Fuse Company, Providence, R. I., was in charge of the company's special agent, F. D. Killion, of the New York office.

Harvey Hubbell, Incorporated, of Bridgeport, Ct., had a working exhibit of pull sockets and other specialties in this line. Mr. and Mrs. Hubbell were in attendance.

The "Ever-Ready" electric novelties and flashlights, made by the American Electrical Novelty and Manufacturing Company, New York city, attracted attention.

The Packard Electric Company's exhibit occupied spaces Nos. 4, 5, 6, 10, 11, 12 and 13, in Section D, in the centre of the hall. Being Canadian representatives of the Crocker-Wheeler Company, the Jandus Electric Company and the American Instrument Company, their exhibit included, besides induction motors, transformers, incandescent lamps, recording wattmeters of their own manufacture, apparatus of the above well-known companies. A complete Jandus series alternating-current system in operation proved of particular interest to lighting men present and was a feature of the exhibit.

A Crocker-Wheeler sixty-five-kilowatt, 250-volt, direct-current generator was also in operation, but owing to delays in freight shipments this feature of the exhibit was not so extensive as had been intended. The Crocker-Wheeler apparatus, however, was well displayed, and the fact of several large orders having recently been placed for this apparatus, both alternating and direct-current, goes to prove that its reputation is being extended through Canada and that the efforts of the Packard Electric Company have not been without gratifying results. The exhibit was in charge of Geo. C. Rough, sales manager of the company, who was very ably assisted by R. A. Stinson, F. Jno. Bell, manager of the Montreal office of the company, and J. E. Ryan. C. L. Eshleman, secretary of the Jandus Electric Company, and Messrs. Milliken, De Gress and Randolph, of the Crocker-Wheeler Company, were also in attendance.

W. J. O'Leary & Company's exhibit was an interesting one. One-half of its space was occupied by a repair shop, in which a number of men were rewinding armatures, form coils, etc. They were also building here a Tesla coil, which is calculated to develop 3,000,000 volts, being constructed under the supervision of L. R. McDonald. In the centre of the space was arranged a table on which was demonstrated the usefulness of the "Auto-Electric" safety switch.

John Langan, of the Okonite Company, New York city, was a visitor to the exhibition.

German Visitors Inspect the Schenectady Works of the General Electric Company.

A party of distinguished German visitors inspected the Schenectady plant of the General Electric Company on Thursday, September 5. The visitors were designated by the German government as a commission to visit America, to inspect electric railways and high-tension transmission systems in this country and Mexico. Included in the party were Privy Councillor Wittfeld, of the Prussian government; Professor Dr. W. Reichel, of the Royal Technical University of Berlin; Director Frishmut, of the Siemens-Schuckert Works; Mr. Pforr, of the railway department of the Allgemeine Elektricitäts Gesellschaft; Director A. Elfes, of the Allgemeine Elektricitäts Gesellschaft, and Director Jordan, of the Lahmeyer Works.

The party left Europe, *via* Geneva, on the North German Lloyd liner Moltke, arriving in New York on Tuesday, September 3. The duty of studying the power-houses and locomotives of the New York Central lines, the Long Island Railroad and the New York, New Haven & Hartford systems, and the plants of the Interborough Rapid Transit Company, was very pleasantly supplemented by entertainments given by the officials of these companies and by the officers of the General Electric Company, who entertained the officials during their visit to Schenectady. In Boston the distinguished visitors inspected the Lincoln street power-house of the elevated lines, the Curtis steam turbine equipment of the Edison Electric Illuminating Company, and the equipment and service of the Boston traction system, including the East Boston tunnel under the Charles river. C. B. Davis, general manager of the Boston office of the General Electric Company, entertained the visitors at luncheon at the Exchange Club. This party included also Gen. W. A. Bancroft, president of the Boston Elevated Railway Company; P. F. Sullivan, general manager of the Massachusetts Electric Companies, and C. L. Edgar, president of the Edison Electric Illuminating Company, of Boston.

At Albany the members of the commission made their headquarters at the Hotel Ten Eyck. Upon reaching Schenectady, on September 5, they were shown through the various departments of the works and entertained at the Mohawk Club. The reception committee consisted of Vice-President E. W. Rice, Jr.; Vice-President J. R. Lovejoy, General Manager G. E. Emmons, General Superintendent E. B. Raymond, Allgemeine Representative William S. Hulse, M. A. Oudin, associate manager foreign department; W. B. Potter, engineer railway department; D. B. Rushmore, engineer power and mining department; J. E. Noeggerath and Eugen Eichel.

The German flag floated all day over the works in honor of the occasion. The commissioners were amazed at the size of the plant and the extent of the electrical manufacturing in progress in the various shops. The big shop, No. 86, where the Curtis turbines and generators are manufactured, impressed the visitors most. In this shop they spent considerable time watching the work in progress throughout the great building. Much of interest was also found in the railway department, the wire and cable shops, the power-house and the foundries. The guests were very enthusiastic over their visit, and made many flattering comments on the plant and methods of operation.

Development and Control of Water Power in Saxony.

Consul J. St. John Gaffney, of Dresden, states that water power is not used to any great extent in Saxony, being entirely limited to small saw and corn mills in outlying mountainous districts. He adds:

The laws relating to the development and use of water power give the right of concession to the ministry of public works. Before any concession is granted the applicant must file plans of the system proposed, buildings, etc., and power required. These plans are laid before the local technical commission, who report to the ministry. No large projects have been accepted during the last decade.

The government has no water-power station in operation at present. Formerly a few turbines were in use for milling purposes on the Upper Elbe, but have been discontinued. All water-power plants at present in operation are in private hands, controlled by the government. As far as can be ascertained, there are only a few plants established, all of which develop but sufficient power for the needs of the mills which own them; no power is rented or sold.

In the absence of any figures as to water power it is impossible to make any comparison with steam power, but the former is absolutely negligible.

Electric Lighting in Germany.[1]

By Professor Dr. Phillip G. Klingenberg.[2]

THE introduction and development of various means of lighting in recent years has been accompanied by critical comparisons between different sources of light, but none have been subjected to more careful tests than electric and gas lights, and it is due to the keen competition between these two systems that each has been brought to the state of perfection in which it is seen to-day.

It is a fully recognized fact that for units of light giving below about 100 candle-power the electric light produced with steam under normal conditions comes out more expensive than gas lighting—at any rate when comparing the cost per candle-power-hour. One can not, however, maintain that this comparison is correct and the only one of importance, in view of the present enormous development of electric lighting with small units.

In spite of all improvements that have been made in gas lighting it has been impossible to obtain for it the peculiarities for which electric lighting is characteristic, and which are commonly known to be the following: easy control of lights from a distance, agreeable shade, great adaptability, its coolness, the absence of gases caused by combustion, the beautiful and varying effects, the possibility of splitting the light into small units, the better light obtained by fixing lamps at an angle, and the possibility of using the current in a lighting installation for other purposes (heating, motors, ventilators, etc.).

Advantages of this kind can not be expressed in figures. They are, however, in many cases, of such importance that the electric system of lighting is adopted in preference to any other, in spite of the higher cost per candle-power-hour.

Owing to the above peculiarities of electric lighting it is very often regarded as a luxury, with the result that electric lights are burned as little as possible in order to keep the lighting bill low. Economy in this direction is easily obtained, because it is so very convenient to switch the electric current on and off again. The effect this has on a plant in the central station is, however, less desirable, since the total capacity installed is annually used for a comparatively short period. A better station load would have been obtained under these conditions if more long-period consumers had been tempted to buy current at more favorable terms than those offered in the uniform rate of charges. The natural consequence of the low consumption in comparison to the capacity of the plant was a high price for current, which formed a hindrance to the introduction of electric lighting.

It has become usual to divide the annual cost for the generation of current into constant expenses and variable expenses. On this basis the constant expenses with modern steam-driven central stations of an average size are between eighty and 130 marks per kilowatt. The variable expenses are between 2.5 and five pfennigs per kilowatt-hour. The figures will, of course, vary according to local conditions. Assuming an average of 100 marks and four pfennigs, respectively, we get the following generating costs for the current in relation to time:

200 hours	54.0	pfennigs.
500 "	24.0	"
1,000 "	14.0	"
2,000 "	9.0	"
3,000 "	7.3	"

It is evident from the above figures that the extra cost per kilowatt-hour incurred through an increase in consumption, the capacity of the plant remaining the same, is very slight indeed. This, however, is quite contradictory to the tendency for consumers to reduce their expenses for lighting by burning lamps as little as possible, because, as far as the generating station is concerned, the extra hours of consumption make very little difference in generating expenses.

If electricity works had come in before gas works they would no doubt have had the advantage of supplying current for lighting installations which are used for long periods, as, for instance, street lighting, etc. The result would have been low tariffs and probably a very large development of the supply to installations burning small units of light. It would then have been exceedingly difficult for gas lighting to compete successfully against electric lighting.

In consideration of the above contradictory circumstances central stations have charged special rates to long-period consumers by introducing tariffs with a certain fixed rate of charges calculated on the maximum current consumed and an additional price per kilowatt-hour shown on the meter. Tariffs of this kind are largely used at the present moment and they fairly well correspond to the actual generating costs. A general introduction is, however, impossible, owing to the large divergency in the use of current and the difficulty of bringing the influence of various classes of consumers to bear satisfactorily on the maximum capacity of the central station. Installations in private houses, for instance, always require a high local maximum, although the effect on the central station is comparatively small, because local peaks do not overlap. To charge a consumer the same fixed rate for a lamp which does not burn often as for another lamp which is lighted regularly is no doubt a hindrance to electric lighting.

A double tariff, as extensively applied in Germany, overcomes this difficulty. The principle on which the tariff is based is to charge the normal price for the current during the time of greatest consumption, but at other times to charge a very much lower price.

One of the advantages of a tariff of this kind is that a power load and a light load will not overlap to the same extent as is the case with the single tariff or the maximum tariff.

We will now consider the influence of pressure on electric lighting. The cost of a continuous-current network is known to form a considerable item in the total capital outlay. For the last ten years preference has been given to a circuit pressure of 440-220 volts in Europe, contrary to American practice. The consideration which led to the introduction of this pressure is that a loss of ten per cent to twelve per cent in the economy of high-tension carbon-filament lamps is more than balanced by a saving in interest and depreciation in the network. In other words, one could supply current to consumers at lower prices in compensation for lamps with a lower efficiency.

The experience gained with the length of life of 220-volt lamps is favorable. This is partly due to smaller fluctuations in pressure in 220-volt circuits than in those for 110 volts. A reasonable tariff and low initial expenditure with the accompanying low rates of charges led to a general introduction of electric lighting with glow lamps and helped to overcome the keen competition of gas lighting.

This is a remarkable fact, especially in

[1] Prepared for the National Electric Light Association, but received too late for the June Convention. Washington, D. C.

[2] (I have to thank Dr. Norden for the assistance he has given me in compiling these notes.)

Germany, where the average consumer very carefully calculates his expenses for lighting. The price of the electric light is, however, still higher than the price for gas lights, and if certain improvements in the manufacture of glow lamps had not been made just in time, the development of gas lighting and the introduction of inverted gas burners, with the accompanying higher efficiency, representing an improvement of thirty per cent, might have seriously hampered the introduction of the carbon filament lamp, although it would never have brought it to a complete standstill.

The improvements referred to consist of the manufacture of lamps with a high efficiency, such as Nernst lamps and metal filament lamps.

The Nernst lamp reduces the consumption per candle-power to half the value for carbon lamps, and has the advantage of being very suitable for high pressure (220 volts), which led to an extensive use in three-wire installations with 440-220 volts. These lamps require a certain time for lighting up after being switched on, but this is a disadvantage which very often is of no consideration. The life of Nernst lamps is practically as long as that of carbon filament lamps, at any rate as far as continuous-current circuits are concerned. The results in alternating-current circuits are not quite as favorable.

The metal filament lamps mentioned above consume just about one-third of the current taken by ordinary lamps with carbon filaments. One of the first of these lamps brought out in recent years is Auer's osmium lamp, with a specific consumption of 1.5 watts per candle-power. This lamp can, however, be made only for about fifty-five volts. Another lamp of this kind is Siemens & Halske's tantalum lamp, which will burn on 110-volt circuits and takes about 1.7 watts.

The latest and most prominent of all metal filament lamps is the tungsten lamp. The filament made by one group of manufacturers is obtained by chemical reaction and not by compression. The inventors state that the manufacturing process, being a chemical one, enables them to obtain very fine filaments with a diameter of 0.04 millimetres, which is impossible with the process involving the application of pressure. Standard lamps will give thirty to forty candle-power at 110 volts. The consumption is about 1.1 watts per candle-power and is reduced to about one watt after fifty hours' burning. These figures have been verified in official tests.

Another group of manufacturers applies pressure for producing a tungsten filament, but the results are very nearly the same, the pressure being 105 or 110 volts with a consumption of about one watt per candle-power.

Very interesting comparative tests were made by Uppenborn, in Munich. He used four new lamps of different type, but all made for 110 volts. A preliminary test gave the following results:

Filament in Lamps Tested.	Current. Amps.	Consumption. Watts.	Power of Light. C.-P.	Specific Consumption. Watt/C.-P.
Carbon.....	0.536	58.9	16.7	3.53
Tantalum ..	0.400	44.0	27.3	1.61
Osmium....	1.012	111.33	63.4	1.76
Tungsten ..	0.520	57.2	57.0	1.00

One of the latest metal filament lamps is the Osram lamp, which is at present made for 110 volts. Careful tests made in the physical laboratory of the government in Charlottensburg show an average length of burning of more than 1,000 hours. Thirty-two lamps were tested in all, and only one lamp consumed as much as 1.22 watts after 1,000 hours, all the others remaining much below this figure. The initial consumption varied from 1.08 to 1.14 watts.

It is a general characteristic of metal filament lamps, when compared with lamps with carbon filaments, that the power of light sinks by five to eight per cent after 200 to 300 hours and rises again afterwards until it reaches the initial power after about 1,000 hours. The current remains fairly constant the whole time, *i. e.,* the watt consumption per candle-power sinks at first and then rises again gradually. The light of carbon-filament lamps, on the other hand, is reduced twenty per cent after about 300 to 1,000 hours.

The superiority of metal filaments is further illustrated by the behavior of lamps under variable pressure. With a twenty per cent increase in pressure above the normal, carbon filaments frequently give three times the normal light, whereas a metal filament lamp will not give this light at a pressure equal to thirty-five to forty per cent above the normal. From this it is evident how very much more insensible to fluctuations in pressure these lamps are than those with carbon filaments.

Since the development of the metal filament lamps it has been prophesied that the supply of current from central stations would become less, owing to the fact that just one-third of the energy now consumed will be required for producing the same amount of light. It is the author's opinion that the general introduction of metal filament lamps will have just the opposite effect.

It should be remembered that, as a rule, consumers like to burn a certain number of lamps and are not so much guided by the amount of light they obtain. Every sixteen-candle-power lamp in their installation will therefore be replaced by a twenty-five-candle-power lamp, since there is no metal filament lamp yet made for a smaller candle-power at 110 volts. Even then the saving in the consumer's light bill will be considerable. In many cases—in restaurants for instance—the lights which have to burn constantly are not electric, but gas or some other kind of light, electricity only being used for table and other lights which are easily switched on and off again according to requirements.

Now that electric lamps with a higher economy are available it will be worth while for a consumer to change over all these long-burning gas lights to electricity. The decrease in consumption owing to less energy per candle-power-hour will be made up by a higher candle-power and longer burning. Central stations will, however, benefit most by the large number of new consumers who have been keeping back up to now owing to the high cost of electric lighting.

The full advantage offered by metal filament lamps will not be experienced until the price of the lamps themselves is reduced from three marks to one mark. It is not at all unlikely that lamps will be sold at the lower figure at an early date, because as far as the cost of manufacture is concerned, there is no very great difference between metal filament and carbon filament lamps.

The fact that metal filament lamps can at present only be made for 110 volts has given rise to a lively expression of opinions in Germany as to the desirability or otherwise of keeping to the present standard three-wire system with 440-220 volts or of changing over to 220-110 volts. The replies to a circular inquiry addressed to the managers of central stations show that a large proportion of central station engineers are in favor of a pressure of 110 volts. In coming to this decision due consideration was of course given to the advantages of 110 volts for lighting with arc lamps.

It is the author's opinion that the question of pressure is largely dependent on another question, *viz.,* whether it will soon

be possible to obtain useful metal filament lamps of small power and for 220 volts. The inquiries made by the author in this direction are all in the affirmative.

An important opinion was expressed by the Deutsche Gasgluhlicht Aktiengesellschaft, the manufacturer of the so-called Osram lamp. The following is a translation of what the firm had to say:

"With reference to your inquiry relating to 220-volt lamps, we beg to say that past experience confirms our opinion that it will not be possible to make 220-volt lamps on a large scale until the process of manufacture of 110-volt lamps has reached a very high state of perfection and the price for the lamps themselves has come down in consequence. It is quite evident that lamps for 220 volts must have very long filaments. The natural result will be a very high percentage of breakages during manufacture, in transit and in practical use.

"It also stands to reason that lamps for 220 volts must give twice as much light as lamps for 110 volts. It will therefore be very difficult to make the lamp which is wanted, *viz.*, one for thirty-two candle-power.

"A further consideration, which corresponds exactly to the conditions experienced with carbon filament lamps, is that 220-volt lamps will not be as efficient as 110-volt lamps. The present carbon lamp for 220 volts consumes fifteen to twenty per cent more current than a 110-volt lamp of equal life. Similar conditions will no doubt prevail with the Osram lamp, so that this fact will add to the difficulties encountered during manufacture, because a lamp for a certain voltage and a higher consumption in watts per candle-power than another must have a higher-resistance filament. We do not think we are misled in believing that the superiority of the Osram lamp for 110 volts as now supplied is a sufficient inducement to engineers in central stations to return to the lower pressure again wherever it is possible.

"On careful consideration it is our opinion that the introduction of 220 volts during the time when no other but carbon filament lamps existed, was a mistake, at any rate as far as lighting circuits are concerned, because the cost of electric lighting was increased, since 220-volt lamps are known to consume fifteen to twenty per cent more current. We will not discuss the question whether central stations suffered a loss by having prevented a large number of consumers from taking in electric light owing to higher cost of current, or whether the saving in mains due to a pressure of 220 volts was sufficient to compensate any other deficiency. We have, however, noticed that many engineers consider it absolutely necessary to return to 110 volts wherever possible and to stop carrying out new installations for 220 volts."

It is evident from the above that eventually we shall get a 220-volt Osram lamp, but that it will not show the same favorable results as the low-tension lamp.

The author has also been in communication with other engineers who have confirmed the possibility of making a thirty-two-candle-power lamp for 220 volts with a consumption of 1.1 to 1.2 watts. As soon as the difficulties in the manufacture of thirty-two-candle-power lamps for 220 volts have been overcome, it must, of course, also be possible to supply sixteen-candle-power lamps for 110 volts. The conditions can therefore now be summarized as follows:

Points in favor of a pressure of 110 volts:

1. Smaller units of light can be installed.

2. The efficiency of lamps is higher (experience will have to show to what extent).

3. Half the number of arc lamps in 220-volt circuits will burn in series.

Points in favor of a pressure of 220 volts:

1. The capital expenditure for circuits is very much lower. Assuming capacity, distance and losses all to be the same, the section of copper is a quarter of that for 110 volts. Assuming equal drop and the same section of wires, one can cover twice the distance or four times the area.

2. The result of the advantages described in point 1, is that one can supply current economically to areas with few consumers.

3. Installations cost less.

Assuming the conditions for metal filament lamps to be similar to those for carbon lamps, the calculations prove that the possible reduction in generating and distribution expense is greater than the loss in lamp efficiency. The writer's opinion is therefore that new schemes should be based on a supply of 440-220 volts as before, in spite of the contrary opinion expressed above.

In three-phase installations the four-wire system has gradually found more and more favor in preference to the three-wire system. It has important advantages, so that higher pressure is of less consequence. The author therefore recommends 360-240-120 volts, star connection, for three-phase installations, especially because there is then no difficulty in making an alteration in new areas if necessary.

The revolution in lighting with small units which will accompany the general introduction of metal filament lamps is sure also to effect the use of more powerful lamps.

For certain purposes for which arc lamps of a particular type have recently gained importance, metal filament lamps are now entering into competition. In recent years a series of designs of arc lamps for small currents were brought out. The Allgemeine Elektricitäts Gesellschaft was the first to supply an arc lamp of this kind; it was called the "Rignon" lamp, after its inventor. Other firms followed suit, giving their lamps names referring to their size, such as Liliput, Mignon, Baby lamp, etc. Most of these lamps were intended for a current of two amperes, but they required a working pressure of about 110 volts per lamp. The first lamps were made for continuous current, those for alternating current being made at a later date. The principle embodied in all designs was a limited access of air, which produced a higher efficiency and a steadier arc, although the length of burning was not equal to that of the original long-burning lamp. Most of the new small arc lamps will burn from twelve to twenty hours. They found favor very quickly and were extensively used for lighting in private houses and workshops, in shop windows, for lighting in railway stations and even for street lighting in small towns.

Let us consider the economy of these lámps. A continuous-current arc lamp on a 110-volt circuit consumes two amperes, and gives a light of about 200 candle-power, thus requiring 1.1 watts per candle-power. A lamp for two amperes is therefore not sufficiently economical. Even a 3.5-ampere lamp will give an average hemispherical light of only 100 to 120 candle-power. The specific consumption is therefore three to four watts per candle-power. It is evident from the above that the small continuous-current arc lamp is not so economical as the metal filament lamp, and that the alternating-current lamp is worse still.

It should be borne in mind that metal filament lamps can easily be made for units of 100 candle-power, so that they are well able to satisfy the same requirements as to power of light as the smallest arc lamps. On the other hand, the latter require to be trimmed, they burn car-

bons and have a sensitive mechanism, a weak point with all these designs. In view of these facts it is not difficult to foresee that progress in the manufacture of metal filament lamps will cause these small arc lamps to vanish altogether.

Arc lamps for 500 candle-power are now considered to be the smallest lamps that it is worth while to make. They are represented by the four-ampere lamp now being manufactured, which has a high economy and will burn on continuous-current circuits. Any source of light of less power than 500 candle-power will be a metal filament lamp.

It is an experience of the lighting industry that consumers seldom make use of a pecuniary benefit offered when a certain source of light has to give way to a better and more economical one, and the ultimate result is always the use of more light for the same money due to improvements in lighting. At present there seems to be no limit in this direction. The metal filament lamp has no doubt created a demand for a better light for indoor lighting, and the eye will soon be accustomed to the improved light indoors and will want equal improvements in streets and open places.

The arc lamp industry is already prepared to meet the future demand for more light out-of-doors. Constant improvements in the design of flame arc lamps have now produced lamps which leave nothing to be desired in this direction. The smallest type of these lamps consumes six amperes and gives a light of 1,500 candle-power. The lamps, however, will give up to 5,000 candle-power. An equal power of light from a single arc lamp was quite unknown up to quite recently, and the ten ampere differential lamp for 100 candle-power was considered quite sufficient for public lighting in large towns. Units of light giving 5,000 candle-power are by no means beyond practical requirements in roads and places in large towns where traffic is congested, as is proved by the lighting of the Potsdamer Platz in Berlin with eight flame arc lamps, each for twenty amperes, giving a total of 40,000 candle-power. The lamps are mounted on two high posts, so that the burning point is fixed at a height of eighteen metres above the level of the road. By this means the source of light itself is not disagreeable to the eye and the lighting of the square is as uniform as possible.

In America there has always been a great tendency to suspend powerful sources of light in towns at a very great height in order to obtain the above-mentioned advantages. It is, however, not possible to develop this system completely without having a source of light similar to the flame arc lamp for twenty amperes which is now being manufactured.

Another great advantage accompanies the introduction of the flame arc lamps, and that is the fact of their suitability for alternating current as well as for continuous current. The ordinary alternating-current lamp for fifteen amperes will not give a light of very much more than 500 candle-power, and it is not easily possible to increase the power of the light by raising the current, on account of the size of wires. This was therefore the limit of lighting with powerful units on alternating-current circuits. Flame arc lamps for alternating current are in every respect equal to those for continuous current, so that single units for 4,000 candle-power can easily be manufactured for both cases.

The consumption of the alternating-current flame arc lamp is not higher than that for continuous current when taking the power-factor of the arc into consideration. The progress made in this direction is of decisive importance for future lighting with arc lamps, because alternating current is being used more and more for feeding circuits covering extensive areas.

Certain points in connection with flame arcs at first hindered their introduction; for instance, it only seemed possible to obtain a yellow light, which did not suit the public taste, especially in Germany. Conditions were more favorable in England and America, because one had become more accustomed to the unusual color of arc lamps owing to the extensive use of long-burning lamps of a violet hue. It is, however, now possible to make highly-efficient carbons giving a very agreeable light which is almost white in color. The steadiness of the arc in flame lamps is not as perfect as it is in differential lamps burning carbons which are not saturated. It is impossible to prevent the arc from flaring up now and then, owing to slight irregularities in the composition of carbons. One has, however, become accustomed to this deficiency in street lamps.

The cost of effect carbons is higher than that of ordinary carbons. To a certain extent this is due to a metal core which is necessary on account of the high resistance of the carbons, due to their great length. The expenses for trimming lamps, etc., are also higher than similar expenses for other types of lamps, because the mechanism is more complicated, and effect carbons leave ashes and other deposits which must be removed very carefully.

According to the experience of a large central station in Germany, using lamps which burn sixteen hours at a time, the costs for every hour of burning are split up as follows:

Trimmers and supervision, about....	2 pfennigs
Effect carbons, about.....4 to	5 "
Maintenance, repairs, spare globes, etc.....	3 "

These figures are comparatively high and may not always be fully covered by the saving in current. The superiority of flame arc lamps will, however, still remain unquestioned, since there is no other type of lamp which will give more than 1,000 candle-power.

A new source of light which is gradually gaining ground in Europe and is competing with other sources of light is the mercury vapor lamp. It is primarily suited for indoor lighting and is used in engine rooms, boiler houses and workshops. An attractive effect is obtained in shop windows and for lighting advertisements. The Berlin Electricity Works has already installed about sixty of these lamps in its boiler houses and engine rooms. The peculiar color of the mercury light is at present a hindrance to its use, but custom and improvements will no doubt overcome this defect in time.

When comparing the power of light, mercury lamps will be found to range between incandescent lamps (metal filament) and arc lamps. Mercury lamps will always retain a certain sphere of usefulness of their own owing to the peculiar shade of their light.

In reviewing the general aspect of electric lighting in Germany, it is impossible to overlook the progress made in gas lighting in recent years. The so-called Lukas light, an improvement of the Auer light, was followed by powerful lamps burning compressed gas, such as the Millennium light and others. As yet, however, no type of gas lamp has given results approaching those obtained with ordinary arc lamps, and no single gas lamp will give a power of light equal to that of a single-flame arc lamp.

The claim for the superiority of electric street lighting is fully substantiated by test results obtained in Berlin streets by Dr. Bloch. His careful measurements show a consumption of about eighteen watts per lux and per 100 square metres with ordinary arc lighting, as against about fifty litres of gas per hour for the same effect produced with the Millennium light.

Review of the Coal Trade in 1906.

The principal feature connected with the coal-mining industry of the United States in 1906 was the practically complete suspension of operations in the anthracite region of Pennsylvania and in the organized bituminous-coal-producing states during the spring months, while the adjustment of the wage scale was under way. This suspension in the anthracite region lasted from April 1 to May 14, during which period only one mine in that district was kept in operation. The amount of time lost in the anthracite region represented 18.8 per cent of the time worked and resulted in a decrease of nearly 5,700,000 long tons. The suspensions in the bituminous-coal-producing states ranged from about thirty days, in some mines, to nearly eleven weeks in others. During the period of idleness a lack of harmony developed in the ranks of the operators and the associations composed of them throughout the several states, and by degrees compromises were concluded with the miners and work was from time to time resumed. The most serious effect of the suspensions was the breaking up of what has been known as the interstate agreement which had been in effect in the competitive states of Pennsylvania, Ohio, Illinois, Indiana and parts of Kentucky and West Virginia, and which also largely controlled the agreements made between the operators and the miners in the southwestern district, composed of Kansas, Missouri, Arkansas and Indian Territory.

In spite of the fact that 211,304 men in the bituminous states were idle for an average of sixty-three days each, and that the idle time was equal to thirteen per cent of the total number of working days made, the bituminous coal production of the United States increased 27,812,082 short tons over that of 1905. This increase was due to the fact that during the earlier months of the year, in spite of the suspension in mining operations, production was pushed to the utmost by both miners and operators. During the suspension mining in the unorganized states, such as West Virginia and Alabama, in the east, and in the Rocky Mountain states, was unusually active, and this unusual activity, together with that following the period of suspension, brought the tonnage up to a normal increase over the output of the preceding year, so that it is doubtful if there would have been any larger total production had no suspension of operations occurred.

Notwithstanding the almost complete shut-down in the mining districts dominated by the United Mine Workers for, as stated, periods varying from one month to eleven weeks, there was no formally declared strike, the miners being simply requested to suspend work pending the adjustment of the wage scale. The occasion was remarkable for the comparatively few instances of lawlessness, and while the chances for a peaceful settlement seemed at times far remote, the differences were finally adjusted without governmental interference or an appeal to arbitration.

During portions of the year the usual complaints of shortage of car supply and of motive power were made by the mining companies. This shortage was particularly felt in the earlier months, when mining was very active and coal was being hurried as fast as possible to distant points for storage.

A detailed account of the coal-trade conditions in the United States during 1906, by states, is given in an advance chapter from "Mineral Resources of the United States, Calendar Year 1906," on the production of coal in 1906, by E. W. Parker, which will soon be ready for distribution.

BOOK REVIEWS.

"The Construction of Dynamos." Tyson Sewell. New York. D. Van Nostrand Company. Cloth. 316 pages. 6 by 8 inches. Furnished by the ELECTRICAL REVIEW for $3.

This book is intended as a student's text-book, and an introduction to the design and construction of dynamos, both alternating and direct. The necessary physical principles are first explained, and the methods of determining the constants employed in design. The work then takes up the details of dynamo construction, explaining in each case the object of the particular part of the methods most generally followed in constructing it. Many examples are given illustrating the applications of the principles here laid down. The book is fully illustrated, both by drawings and half-tones of actual machines.

"Electric Blasting Apparatus and Explosives." William Maurice. New York. D. Van Nostrand Company. Cloth. 166 pages. Illustrated. 5½ by 8½ inches. Furnished by the ELECTRICAL REVIEW for $3.50.

In this treatise on electrical apparatus for blasting purposes, the author explains the various methods employed, describes the apparatus used and gives directions for the most satisfactory way of applying the electrical method, which, it is said, has almost entirely replaced older methods. To any one desiring information on this rather special branch of engineering this book will be useful.

"Alternating Currents." C. G. Lamb. New York. Longmans, Green & Company. Cloth. 326 pages. Illustrated. 6 by 9 inches. Furnished by the ELECTRICAL REVIEW for $3.

This text-book on alternating currents was written to supply the peculiar needs of the author in a course for the students in the engineering laboratory at Cambridge, England. This school takes men through a rather broad course, so that a great deal of time could not be given to any one subject. On the other hand, the shorter text-books on alternating currents seem too elementary for the work in hand.

The subject here is treated largely by the use of vectors and by simple analytical methods when it is desired to obtain numerical results. The symbolic treatment is not used, as it is applicable to but few problems. The book is theoretical throughout, there being no descriptive matter. The latter part of the work the author believes is better obtained from actual practice.

"Finances of Gas and Electric Light and Power Enterprises." William D. Marks. New York. Published by the author. Cloth. 540 pages. 5½ by 7½ inches. Furnished by the ELECTRICAL REVIEW for $4.

In this book the author has brought together a number of papers and reports on financial operation of gas, electric light and power companies. To these have been added chapters giving the results of original researches into the cost of electric and gas street lighting and railway rates in certain large cities. Another chapter is a digest of the evidence given in the lawsuit resulting from the reduction in the price of gas in New York city. The book first takes up the question of railway finances, giving averages for nearly 800 street railways, and for interurban electric railways. There is a statistical report from the Palouse & Spokane Electric Railway. Chapter III gives a partial analysis of small and unprofitable electric lighting and power enterprises. Chapter V deals with lighting companies, particular attention being paid to the conditions in Massachusetts. Chapter VII takes up the finances of district heating and electric plants. Chapter IX deals with the overlooked losses in stations. Chapter XI is on the cost of street lighting and chapter XII on the prices for gas and electric lighting in New York city. Chapter XIII deals with the relation between the lighting companies and a number of the important cities in this country. Some of the reports go into considerable detail, even giving instructions for the behavior of various employés of the company being dealt with. The book contains a large amount of information on the electric light, power and railway industries of this country.

Electrical Notes from Great Britain.

(From Our British Correspondent.)

ARRANGEMENTS have been announced for three important exhibitions that are to be held in the United Kingdom during 1908. From an electrical point of view the chief will be one run on similar lines to that held at Olympia in 1905, and it will take place in the Manchester district. Though in the main it is set on foot by the Manchester and Salford corporations, in the hope of benefitting their electricity supply undertakings, it is to have the hearty co-operation and support of the national electrical contracting and manufacturing organizations, the Municipal Electrical Association, and electric light and power suppliers (municipalities and power distribution companies) in the northern part of England. An executive committee consisting of representatives of all these different interests, and also including exhibitors' representatives, is to be appointed. As at Olympia, it has been arranged that the profits from the show shall be devoted to a reduction of the space payments of exhibitors and to electrical trade and other benevolent funds and purposes. The exhibition at Manchester will last for a month and the city electrical engineers of Salford and Manchester (V. A. H. McCowen and S. L. Pearce) will act as consulting electrical engineers, W. Davenport, of the National Electrical Manufacturers' Association, will act as organizing secretary, and C. S. Northcote, who is honorary organizer of both the manufacturers' and the contractors' associations, will be one of the moving spirits of the show, as he was at Olympia.

Very elaborate preparations are being made for the Franco-British Exposition, which is to be held in London (at Shepherds Bush), for six months in 1908. A great deal of space will be available for engineering and the arrangements for electrical exhibits in this section have received the support of the Institution of Electrical Engineers, with Dr. R. T. Glazebrook, its present president, as chairman of the electrical committee.

Edinburgh, too, next year is to have a big show—the Scottish National Exhibition—with an industrial hall of 100,000 square feet, and a machinery hall of 20,000 square feet. Electrical machinery, scientific apparatus, transportation and motive power, are among the special sections in these departments.

It may be mentioned also, that there is to be a "World's Great Mining Exhibition" at Olympia, and in view of the great advances that electricity is making in mining work, electrical manufacturers may not be able to ignore it. From the above it will be seen that 1908 is to be a year of exhibitions over here and electrical engineering firms and suppliers will be in somewhat of a dilemma to know where to show and where not to show.

The Johnson-Lundell Electric Traction Company, Limited, has commenced legal proceedings against Raworth's Traction Patents, Limited, which will be recognized as the company that has energetically and successfully exploited regenerative tramcar control and demi-cars during the last few years, for infringement of patents. Users of the systems involved (two tramway-owning companies and one municipal tramway concern) have likewise been proceeded against. The British patents are Nos. 7979, of 1899, and 26,668, of 1902, for "inventions in respect of improvements relating to methods of and means for regulating electric motors and controlling arrangements for electric motors and motor circuits."

The North Eastern Railway is reported to have definitely under consideration a proposal to electrify its lines between South Shields, Sunderland and Newcastle-on-Tyne. A report by the company's engineers is said to be in course of preparation. It is interesting to observe that the company's existing direct-current lines are giving very satisfactory results. For the past half year the cost of this working has shown a slight increase, but this is due to the larger number of trains and car-miles, and the receipts show a more than corresponding increase. The earnings on these sections have now, under electric working, been got back to nearly what they were five years ago, when the electric tramway competition of the districts commenced.

The corporation of Bradford, which some years ago won the reputation of being the most enterprising municipality in securing small power users by reason of its motor-hiring facilities, has had to face a difficulty arising from the loss of the users of larger powers. T. Roles, the city electrical engineer, has reported upon the position, recommending certain alterations in the rates of charging so as to retain the big power users who remain, and if possible bring on others. He points out that the sale of electricity from the municipal station is not increasing to anything like the extent expected, and that the output for power purposes has remained practically stationary since 1904. Up to that year the average horse-power of the motors connected gradually rose from 3.5 to 5.1, but since that date it has dropped to 4.8. He says that this undoubtedly has been effected by the larger consumers going over to their own private generating plants, or adopting gas engines operated by suction gas. If new rates be not approved, Mr. Roles considers, there will be no headway made by his department, as the gain in small consumers will be more than counterbalanced by the loss of large consumers, whom the present charges must fail to retain.

A company has started operations in London under the title of Platinum Substitutes, Limited, for manufacturing the Bastian-Calvert leading-in wire for electric incandescent lamps, which was described in the ELECTRICAL REVIEW recently, in the paper read by C. O. Bastian before the Institution of Electrical Engineers (Glasgow).

The higher prices of coal are making themselves felt among electricity suppliers. A couple of months ago gas companies announced advances in gas charges to the consumers consequent upon rises in coal, and one hears of electric light stations which are going to feel these rises somewhat seriously in their accounts. It looks almost as though if charges are not advanced in some places there must be increased losses on working. At Derby it is announced that the increase in the coal bill for the current year will be $5,000, and on that account any reduction in the electricity charges is impossible. While on the subject of coal prices, it might be mentioned that the coal bonus scheme adopted at Cheltenham electricity works has been so successful that it is to be extended. A saving in coal to the value of £11 17*s.* 2*d.* was effected in four weeks recently, and as the bonus payments were only £1 16*s.* 7*d.* there was a net saving of £10 0*s.* 7*d.* So far the bonus has been divided among the men on evening shifts

only, but it has now been decided that the present bonus of 2*s.* 6*d.* for each hundredweight per 1,000 units be increased to 5*s.*, the extra 2*s.* 6*d.* being equally divided between the day and night shifts in the same proportions as at present. As a result of this change a larger saving is expected by the borough electrical engineer.

The Glasgow Corporation electricity department, in its report just issued, also refers to increased working expenses, both last year and this, due to coal. It cost £26,925 for coal for the year ended May, 1907, as compared with £19,732 in 1906, the output in units generated being 32,000,000 and 26,000,000, respectively. These figures represent a thirty-six per cent increase in coal cost for only a twenty-three per cent increase in units generated.

Important action is being taken by the home office for the better protection of workers in the neighborhood of electrical machinery and apparatus. A new set of regulations under the factory and workshops acts has been drafted and is now in circulation, applying to all premises coming under these acts, wherein electricity is generated, transformed, distributed or used, and at all pressures above 130 volts continuous and sixty-five volts alternating. In justifying the specification of these low pressures, the government department says it has been guided by the consideration that while the serious accidents from shock which have occurred have been at higher pressures than these, there may be danger in still lower pressures. It is pointed out that the opinion that is sometimes expressed that low-pressure shocks are not dangerous is abundantly proved to be wrong, for fatal cases of shock at low pressures are by no means of rare occurrence.

J. Alex. Bell, the city electrical engineer of Aberdeen, has laid before his corporation a statement showing the trouble that his department has experienced during the last twelve years owing to gas explosions occurring in the electric light culverts and manholes. Space does not permit of an account of these nor of the measures that have been taken, as the result of expert advice, to prevent them. Mr. Bell now has recommended the replacing of the existing copper strip culverts by cables laid on the solid system, and that all important manholes on cable work be replaced by section boxes placed above ground. The procedure he will adopt is to lay a distributing cable on the inside of the existing culverts, tapping on consumers as the work proceeds, then to lift the pavement over the culverts and remove road boxes and lay the feeder cables on the solid system inside the concrete culverts, filling in solid with earth before replacing the foot pavement.

ALBERT H. BRIDGE.

London, August 31.

A Study of the Causes of Inverse Discharge in Induction Coils.

A recent issue of the *American Quarterly of Roentgenology* contains an interesting article by H. Clyde Snook upon the causes of inverse discharge in Roentgen tubes. The great problem in the use of an induction-coil for X-ray work is the finding of some means for preventing the current from passing through the tube in the wrong direction. This passage of the current is known as the inverse discharge, and if it be allowed to take place it soon puts the tube out of working order, an effect which is well known, but the reasons for which are not so well understood.

Mr. Snook has made a careful study of this effect by means of an oscillograph, and in this article he exhibits a large number of oscillograph records which show the different character of the discharge at the secondary terminals and of the primary current when the characteristics of the coil are changed, such as increasing the inductance or the capacity of the auxiliary condenser, and also due to the different types of interrupter used. These records show clearly, when the inverse discharge takes place, how it is affected by the type of interrupter employed. From these records Mr. Snook points out several causes for the inverse discharge. The old idea was that it tends to form at the "make" with all types of interrupters, and the curves confirm this so far as it goes; but additional sources of its formation are also shown. Two of these are the oscillation of the condenser bridged across the break, and the oscillation of the secondary as an open-circuited Hertz resonator. A third but minor source of inverse discharges is the oscillation due to the capacity of the electrodes of the tubes and the wires which lead from the coil to the tube.

To minimize the formation of inverse discharge due to the "make," the coil-maker must use generous proportions and large quantities of material. The question of cost comes in here and a compromise must be made. It seldom occurs that the tubes in common use will permit the passage through them of current due to the oscillation of wires which lead from the coil to the tube, but in some coils the oscillations of the secondary frequently go into the tube.

In addition to proper coil construction to reduce the inverse voltage, there may be used in series with the tube, resistances of various kinds which will minimize the inverse current. Among these are various kinds of spark-gaps and valve tubes. Mr. Snook has found that a good valve tube is the most efficient of these devices if its vacuum be maintained at the correct point. The objection to these tubes is the difficulty of maintaining a correct vacuum, which is particularly great when heavy and long duty is demanded of the valve. A plain series spark-gap is the simplest and easiest thing to use, and it is better than many so-called "valve tubes," but not so efficient as a really good valve tube. The advantage of the latter lies in the fact that it offers very little resistance to the direct discharge and a large resistance to the inverse.

Mr. Snook also points out some objectionable features frequently found in interrupters. All platinum contacts require filing at times and occasional renewal of the platinum. Electrolytic interrupters are mussy, and those using sulphuric acid objectionable because of the corrosive acid spray emitted. Mercury interrupters require periodical cleaning. A mercury turbine jet interrupter gives trouble when its contact segments wear away due to arcing and to amalgamation.

Edison Company in Italy.

Despatches from London, dated September 14, state that the Edison Power Company has arranged for an extensive supply of high-tension energy in Italy. Contracts have been made with the municipalities of Rome, Genoa, Naples and Milan. The installation will be begun at Milan in a few days.

J. F. Cummings, of the National Fireproofing Company of Detroit, will secure the distinction of laying the first electrical conduit in Italy. Mr. Cummings has already laid conduits in Russia, Belgium, South America and England, and has secured the unique record of laying conduits along the Strand, Fleet street and Ludgate Hill, London, in a week, finishing them just in time for the coronation procession.

The Edison company will first operate the tramways in Milan, under an arrangement whereby the municipality lays and owns the tracks, the Edison company owning the cars and paying the city mileage for each car. The work in other cities will soon be started.

THE CANADIAN ELECTRICAL ASSOCIATION.

SEVENTEENTH ANNUAL CONVENTION, MONTREAL, QUEBEC, SEPTEMBER 11-13.

The seventeenth annual convention of the Canadian Electrical Association was held in the Assembly Hall of the Canadian Society of Civil Engineers, in Montreal, September 11, 12 and 13, and proved a very successful event.

The attendance at each of the sessions was good, about 200 registering on the opening day, which was considerably added to by late arrivals. Many new names were added to the list of members.

A good programme of interesting papers was presented, with their discussions entered into generally, and the question box was ably conducted by A. A. Dion.

Besides the business meetings an extensive programme of entertainment was provided, with special features for the ladies. On Wednesday night the members attended the Electrical Show at the Drill Hall in a body.

The arrangements were in the hands of a local committee, consisting of Henry D. Bayne, chairman; Ald. Sadler, J. W. Pilcher, L. J. Belnap, E. F. Sise, Watson Jack and D. McDonald.

The opening meeting was called to order Wednesday morning, September 12, by President R. G. Black.

The report of the secretary-treasurer, T. S. Young, Toronto, showed that there was a total membership of 302, ninety members having joined since the last convention in June. The use of electricity in Canada is becoming more general. Figures quoted from the report of the Electric Light Inspection Branch of the Inland Revenue Department for 1906 showed that there were 368 central stations controlled by private companies and municipalities, operating 16,205 arc lamps and 1,828,507 incandescent lamps. To this must be added the large number of isolated plants not doing a commercial business.

After the secretary's report the president made his annual address and stated that the association was fortunate in being able to hold its meetings in the home of the oldest engineering society in Canada, and gave a review of what had been accomplished in Canadian electrical engineering since last year's meeting of the association at Niagara Falls.

With the high prices of copper, wages and running expenses and the likelihood of a central station's income being reduced by the use of the newer high-efficiency lamps, the need of developing new uses for current was dwelt upon by the president.

After the president's address the adoption of the new constitution was moved and carried.

A. B. Lambe then read the first paper on the programme, on "Electric Heating and Cooking Devices," the author explaining the construction and showing samples of the various heating devices on the market. Mr. Lambe touched on the commercial side of these devices as well as the electrical, bearing particularly on their value as a benefit in building up a day load.

The afternoon session commenced with the reading of a paper by M. A. Sammett on "Trials of the Operating Man," followed with a paper by B. T. McCormick on "Three-Wire Generators."

Mr. Sammett, in his paper, details a number of difficulties which are encountered by the operating man. The paper is devoted particularly to the difficulties which are subject to control. He points out that a lack of proper foresight in planning an installation has been responsible for a good deal of trouble. His conclusion is that plants should be laid out with liberal provisions for emergencies. The performance of the apparatus under normal as well as emergency conditions should be thoroughly understood. Small service transformers should be of the core type. To insure proper parallel operation of transformers, records of transformers' impedance voltage should be kept.

Mr. McCormick, in his paper, calls attention to the improved efficiency of three-wire generators, and shows the advantage which may be derived from using a compact unit in preference to two individual generators connected-up for three-wire service and tapped at their neutral points. Diagrams are given showing the methods of connecting the three-wire generator when used with a balancing transformer connected across slip rings, and also when the generator is provided with a two-phase combination of balancing transformers.

On Thursday morning the following papers were read: "High-Tension Insulators from an Engineering and Commercial Standpoint," by Clarence E. Delafield; "The Value of the Nernst Lamp to the Central Stations," by A. E. Fleming, and "Incandescent Lamps," by J. M. Robertson.

The paper by C. E. Delafield called attention to the increasing voltage in transmission lines, and stated that the design of an insulator for high voltages should involve a consideration of all of the effects of electrical tension on the dielectrics in the vicinity of the conductors. Present practice has demonstrated that wood can be safely accepted for insulator pins up to 25,000 or 30,000 volts. Beyond that it is advisable for mechanical reasons to use malleable iron; but the so-called pin type of insulator has reached such dimensions in the endeavor to meet the requirements for higher voltages that it seems to be the consensus of opinion of high-tension engineers that this type of insulator has reached the limit of good line construction. The author holds that it is necessary to make a radical departure from the present practice of pin insulation in order to take care of the various difficulties that are encountered in the construction of insulators for the higher voltages. It is his belief that a suspended form of insulator will be the type that will be used, it being from a mechanical standpoint a comparatively simple matter to suspend any desired weight; and from an electrical standpoint it seems possible to so design an insulator that it will be mechanically strong and a good dielectric as well. The author discusses the utility of the engineering design and composition of a high-tension porcelain insulator. The porcelain of which a high-tension insulator is made is composed of certain proportions of English ball, China clay, some domestic clay, commonly called Tennessee, and some feldspar and quartz. The clay forms the body and gives the proper mechanical strength, while the function of the feldspar and quartz is to act as a flux and thoroughly permeate all the parts of the insulator, thus making a thoroughly vitreous mass when subjected to a sufficient heat.

In his paper Mr. Fleming describes the Nernst system and calls attention to the advantages possessed by the system as regards its color values and its efficiency of operation.

Mr. Robertson's paper dealt with the improvements in the various makes of incandescent lamps. The paper was illustrated by the exhibition of several of the newest forms of these high-efficiency units.

The discussion on this paper brought out the opinion that it would be a long while before the factories would be able to turn out lamps in sufficient numbers to seriously affect the central stations. It

was argued that there would be plenty of time for the industry to adjust itself to the new conditions before the new lamps came into general use.

At the afternoon session papers on "Frazil and Anchor Ice—a Simple but Effective Remedy for the Difficulties They Cause at Hydraulic Plants," by John Murphy, and "Illumination," illustrated by lantern slides, by V. R. Lansingh, were read. The question box, which was deferred from the day previous, was also opened on this day. In the evening the members and guests attended a theatre party.

Mr. Murphy presents some very interesting matter concerning the formation of frazil and anchor ice, and devotes considerable space to details of the efforts which have been made to combat these troubles. He shows how the Ottawa Electric Company maintained service throughout the severe winter of 1905-1906 by adopting a method of supplying heat to the operating apparatus and overcoming the initial formation of ice which would shut down the machines. Five sets of wheels in one station are supplied by a boiler which is unable to consume more than a ton and a quarter of coal in twenty-four hours, and steam is not supplied to the wheels continuously; it is only injected when the gates are inclined to get stiff or when the wheels show signs of dropping their loads. The wheels have all been hurriedly fitted up, and no return pipes from the wheel cases to the boiler have been installed, so that the arrangement is by no means either an ideal or an economical one. The steam or condensed steam is lost down the draft tubes. Mr. Murphy declares that the protection of the racks and penstocks and draft tubes from the action of the air, and the application of such an amount of energy as will keep the temperature of the parts of the apparatus through which the water and the frazil ice flow a thousandth of a degree above the freezing point, will absolutely prevent frazil from interfering in any way with the operation of a hydraulic power plant.

Mr. Lansingh gave a brief sketch of the growth of the idea of illuminating engineering leading up to the organization of the Illuminating Engineering Society. This society was founded in 1906, and now numbers 1,047 members, with branches in New York, Boston, Chicago, Philadelphia and Pittsburg. Illumination must be considered from three standpoints: first, the physical standpoint, or that which has to do with the laws of light; second, the physiological standpoint, or that which has to do with the effect of light upon the eye; third, the psychological standpoint, or that which has to do with the effect of color, environment, etc. After elaborating on these points the lecture was continued with about seventy-five lantern slides showing examples of the three different viewpoints enumerated above. Photometric curves of all standard globes and reflectors on the market, consisting of ground glass, opal, mirror reflectors and prismatic glassware of the Holophane type, were shown. The lecture and lantern slides also showed the practical applications of these curves, giving examples of interior illumination.

At the executive session on Thursday afternoon, the following officers were elected: R. S. Kelsch, Montreal Light, Heat and Power Company, president; W. N. Ryerson, Ontario Power Company, first vice-president; R. M. Wilson, Montreal Light, Heat and Power Company, second vice-president; T. S. Young, Toronto, secretary-treasurer; managing committee: A. A. Dion, Ottawa Electric Company; B. L. Reefor, Georgian Bay Power Company, Lindsay; C. B. Hunt, London Electric Company; J. M. Robertson, Montreal Light, Heat and Power Company; J. J. Wright, Toronto Electric Light Company; J. G. Glassco, Hamilton Cataract Power, Light and Traction Company; R. G. Black, Toronto Electric Light Company; W. Williams, Sarnia Gas and Electric Light Company; H. O. Fisk, Peterboro Electric Light Company; J. W. Purcell, H. Walker & Sons, Walkerville.

On Friday morning a paper entitled "Modern Lighting Transformers" was read by G. P. Cole.

Mr. Cole declares that in any attempt to effect an improvement in transformer design the manufacturer must increase what might be called the specific utilization of material—that is, the weight of active material per kilowatt output must be reduced. To accomplish this it is quite evident that a sheet steel of low core loss must be used. Within the last couple of years several sheet steel manufacturers have produced special alloyed sheet steel of low watts loss. The question of aging of the iron is no longer a bugbear, as transformers to-day hardly ever operate at more than eighty degrees centigrade, and at this temperature aging is not a serious menace. Mr. Cole states that the design and construction of lighting transformers has been remarkably advanced by the use of coils insulated by the vacuum impregnating process. The impregnating compound converts the cotton covering of the wires and the coil insulation into a solid mass which has much better heat dissipating qualities than the plain cotton covering of the copper and the untreated layer insulation.

This led to an interesting discussion of the best methods of grounding the current from the transformers so as to take care of any sudden rush of current due to lightning or a breakdown.

George H. Montgomery presented a paper entitled "The Responsibility of Electric Companies for Accidents."

Mr. Montgomery discusses the subject of responsibility of electrical companies for accidents from a legal point of view, quoting several decisions which have recently been handed down both in the Dominion and in the United States, and citing the technical elements upon which the cause has been considered.

The selection of a meeting place for next year, the naming of standing committees and all other business was left to be settled by the committee of management, and the convention adjourned.

In the afternoon the delegates and guests visited the races at Blue Bonnets, and were entertained in the evening at Dominion Park.

Electricity in Advertising.

In an address delivered before the convention of the Pacific Coast Advertising Men's Association, at Sacramento, Cal., July 19, Bury Irwin Dasent, advertising manager of the Portland (Ore.) Railway, Light and Power Company, called attention to the relation of electricity to advertising in its utilitarian aspects. Mr. Dasent considers that the ultimate aim of any advertiser is to make the name of his product as nearly standard as possible, so that when one thinks of that particular article or experiences a desire for it, he will recollect the best-advertised brand. To attain this end most readily the advertising must be so devised that a retinal image of this particular product or of its name or brand is readily transformed to the brain of the public. This is best brought about by the use of electric signs. Displayed under the electric light, a merchant's wares take on a new character. The visual impression gained is worth many times the cost of the illumination. Electric signs have assumed such importance in the business-getting plan of progressive merchants that even staid and conservative concerns such as banks have been brought to a realization of their value.

LETTERS TO THE EDITOR.

The Effect of Higher-Efficiency Lamps Upon Station Output and Income.

To the Editor of the Electrical Review:

Your favor of August 20 with enclosure has not had earlier attention because of my absence from the office for a period of two weeks. I am, therefore, not undertaking to comply with your request upon the presumption that whatever I might have to say with respect to the matter mentioned in your letter would reach you too late for publication in the issue in which you desire to use it.

Generally speaking, however, our company is in sympathy with the production of all electricity consuming devices whose tendency would be to cheapen electricity to the consumer. We believe that the question of diminishing the station output usually following the introduction of more economical devices works itself out finally to the advantage of the central station, although there may be, and probably will be, a period between the general introduction and use of the devices and the final working out of the problem during which the income to the central station will be somewhat reduced; but our experience is that there is an almost instant increased consumption per meter installed whenever the cost to the consumer per unit of service is lessened.

The fact is, I think, that there are so many avenues open for the introduction of electric service that proper attention to cultivating these fields at the time more economical devices are being generally installed will, in most instances, compensate the central station by increased output in the one direction as against probable decreased consumption in the old established channels.

Yours very truly,
A. L. Selig, General Manager,
The Edison Electric Company.
Los Angeles, Cal., Sept. 4.

To the Editor of the Electrical Review:

If the one-watt lamp is now to become a reality, the central station will be found prepared for it. If such a change from present methods could be immediate, the result might cause temporary apprehension. We may, however, count upon the conservatism, the skepticism, or the procrastination of the customer, as well as the mechanical limitations of the factory, to give the electric producer ample opportunity to adjust itself to the new conditions. The substitution of the new lamps for old incandescent lamps suggests diminished consumption; but this will be offset in a measure by the increased consumption due to their substitution for inside arc lamps. The opportunity in most fields of supplanting other methods of illumination now considered cheaper will produce much new business to compensate for any diminished consumption in other directions. Cheap light means more light to most consumers. The problem in its economic features is comparable with the difficulties encountered by the cheapening of production due to the introduction of labor-saving machinery. In a few cases the old employé suffers, while in a broad view the laborer receives the greatest benefit from the new invention.

Unless a lighting company is at present doing more than its usual proportion of the lighting business, it may welcome the high-efficiency lamp as a needed stimulus to its business.

Allen Hollis, President,
Concord Electric Company.
Concord, N. H., Sept. 9, 1907.

Wireless Telegraph Service Between Canada and Europe.

Consul A. F. Dickson, of Gaspé, in Quebec, makes the following report on the new wireless telegraph service between the British Isles and Canada:

The Marconi company announces that it will be prepared for wireless telegraph service between the United Kingdom and Canada in September. The messages will be transmitted between Clifton, Ireland, and Glace Bay, Nova Scotia. The regular rates will be five cents per word and the government and press rates two and one-half cents. Great improvements have been made lately to the station at Glace Bay, which has been moved to a more favorable situation and much enlarged. The station at Clifton has also been improved in order to meet the situation. The first stations erected were found to be too small. For some time past the Marconi company has had communication across the Atlantic, and exhaustive tests have been carried on. The company has been transmitting messages from this side to England for some time, but it is only recently that the communication from England to Canada was thoroughly successful, and now that the tests have proved satisfactory the company intends entering the commercial field at once.

Electrical Supplies for the Navy Department.

The Bureau of Supplies and Accounts will open bids in Washington, D. C., on September 24 for the following material:

Seventy-four junction and angle boxes, with outlets, for delivery at the Naval Magazine, Iona Island, Rockland county, N. Y.; 1,000 feet of rubber-covered conductor, for delivery at New York, N. Y.; 5,000 feet of miscellaneous conductor, for delivery at New York, N. Y.; 200 cells, dry, for delivery at New York, N. Y.; one set of armature coils, for delivery at Washington, D. C.; 2,000 arc lamp carbons, for delivery at Charleston, S. C.; 4,300 feet conduit, etc., miscellaneous, for delivery at New York, N. Y.; miscellaneous electrical supplies, for delivery at New York, N. Y., Washington, D. C., Charleston, S. C., Portsmouth, N. H.; two steel plate electric fans, for delivery at New York, N. Y.; 3,460 sets of interior fittings for porcelains, etc., 500 Leyden jars, twenty receiver sets, 1,000 feet soft iron insulated wire, for delivery at New York, N. Y.; 10,500 feet miscellaneous wire, for delivery at Naval Magazine, Iona Island, Rockland county, N. Y.

Bids will be opened at Washington, D. C., on October 1, for the following material:

Miscellaneous batteries and carbon brushes, for delivery at New York, N. Y.; 261 bells and buzzers, for delivery at Norfolk, Va.; eighty water-tight bells, for delivery at Boston, Mass.; 10,000 carbons, for delivery at New York, N. Y.; miscellaneous electrical supplies, for delivery at New York, N. Y.; 20,700 miscellaneous fuses, for delivery at Norfolk, Va.; 30,000 fuses, for delivery at Boston, Mass.; 875 miscellaneous globes, for delivery at New York, N. Y.; 3,220 globes, shades and screens, for delivery at Norfolk, Va.; 11,700 incandescent lamps, for delivery at New York, N. Y.; twenty-five signal lanterns, for delivery at Norfolk, Va.; miscellaneous conduit fittings, for delivery at Boston, Mass.; 500 water-tight plugs, for delivery at Norfolk, Va.; fifty portables and lanterns, for delivery at Norfolk, Va.; 1,700 miscellaneous sockets, for delivery at Norfolk, Va.; 4,240 miscellaneous switches, for delivery at Boston, Mass.; 400 pounds insulating tape, for delivery at Boston, Mass.; 1,300 pounds miscellaneous tape, for delivery at Norfolk, Va.; 1,500 unions, for delivery at Boston, Mass.; 44,000 feet miscellaneous wire, for delivery at New York, N. Y.; 100 pounds damp-proof wire, for delivery at Boston, Mass.

Direct and Indirect Methods of Electric Purification of Water.

A discussion is given here by Henry Leffmann of a number of proposed systems for purifying water electrically. Some of those described are of questionable value, since there is no proof that they are effective in destroying the microbic life in the water, for which purpose they were devised. In one of these methods the water was run through a tank in which electrodes were arranged between which high-tension discharges were passed. It was expected that the shock due to these discharges would kill the bacteria, but there is no proof of effectiveness of the method. Several other so-called electrical methods employ aluminum electrodes. These methods clear the water because the electrolytic action of the current produces aluminum hydroxide in the colloidal state which entangles the organic matter of the water, enabling it to be filtered out rapidly. Where there is a large amount of suspended matter, these systems will show material improvement and will remove a considerable proportion of the microbic contents, but if the water contains only a little suspended impurity, the purifying action is relatively low. The loss of electrode is a serious item of expense. One system of this kind was put forward with the assertion that it removed the scale-forming ingredients of the water; but as these ingredients are soluble, the aluminum hydroxide can have but little effect upon them. It has also been attempted to secure a more powerful action by combining an electric method with the Anderson process of purifying water, which consists of agitating it with metallic iron. This produces a more rapid solution of the iron, but it has not yet been shown that there is any corresponding gain. The author believes that the most practical benefit of the application of electricity to water will come from an indirect method; one in which the electric energy is used to produce an active disinfecting agent, such as ozone, which is later used for treating the water. For this purpose ozone is particularly good, since it is an active oxidizer and adds nothing to the water. Moreover, excess of the material is harmless, since it rapidly reverts to oxygen. In preparing ozone, care is necessary to use dry air, otherwise hydrogen peroxide is formed. One of the most necessary conditions in such an installation is that it shall operate continuously. For this purpose the ozone-producing plant should be installed in duplicate. In applying such treatment, it seems best roughly to strain the water first, thus removing the larger part of the suspended material. The water is then treated with ozone by allowing the latter to bubble up through long tubes. The water thus treated is then filtered and is found to be clear and practically sterile. It is said the operating expenses of such plants are low, they require small space and make possible the use of much smaller filter beds than are required when no such treatment is applied. Some data are given, showing the results of a test of an experiment system of this kind in Philadelphia. These show that the energy required varied from 172 to 208 kilowatt-hours to the million gallons of water, the sterilizing after the treatment being practically completed.—*Journal of the Franklin Institute, Philadelphia, September.*

Electromedical Equipment at the Royal Devon and Exeter Hospital.

After many years of makeshift apparatus for administering electricity as a remedial agent, the governors of the Royal Devon and Exeter Hospital at Exeter have installed a modern electrical department which is described in *Electrical Engineering,* London. An entire set of rooms in the basement has been set apart for this purpose, making a compact department. The current, which is continuous, is supplied from a private plant of the hospital, and is brought to the distributing switchboard in the medical officers' consulting room, so arranged that the current can be switched to any one instrument or to all, and is under lock and key.

One of the most noteworthy instruments in the equipment is a Finsen-Reyn lamp of the latest type, with automatic arc striking mechanism. This lamp runs from a 110-volt circuit, the current being controlled by means of a resistance behind the switchboard. The lamp is provided with quartz lenses and water jackets.

In the adjoining room, enclosed in brick walls and flush boarding lined with sheet lead, is a fifteen-inch induction coil with a special arrangement of condenser, and fitted with a mercury motor dipping break. This apparatus is used for the X-ray work, a very complete equipment of these instruments being supplied. The same room contains a high frequency apparatus operated from the same induction coil. The next room is fitted for general medical faradisation, and contains a small dynamo constructed to furnish three-phase sinusoidal currents. The same room contains a rhythmical interrupter, by means of which the current is made to wax and wane rhythmically, either quickly or slowly, as may be decided on.

In the next room a full-length porcelain bath is placed, for the administration of various forms of electrical current to the entire body. This bath is supported on three piers built on thick glass, special discharge arrangements for the water being fitted to prevent earthing at this point. Various other minor uses of electric current for medical purposes are also provided in this hospital.

Incandescent Lamps in Italy.

Consul Paul Nash, of Venice, reports on the best method of introducing street lights and incandescent lamps other than electric into Italy. He writes:

In regard to street lights, there is little chance of doing much business in a country where electricity is growing cheaper with every new development of the unlimited water power which exists here, but in domestic incandescent lamps something might be done if one is willing to make the necessary concessions to meet the exigencies of the trade. To do this the dealer should use the Italian language in correspondence and should be willing to send free samples, give the prevailing credits, be willing to begin with small orders and to make the same prices on them as for large quantities, take great care in packing and shipping promptly, quote prices c. i. f. in lire, with metric weights and measures, and in general assume an attitude of confidence in customers, instead of treating them with suspicion.

Another point which is often detrimental to American chances of success is the tendency observed among certain American manufacturers to put themselves too absolutely in the hands of their shipping agents, who sometimes, for reasons best known to themselves, ship by the longest and most indirect routes, thus causing vexatious delays. A little attention to this point would save many a customer.

Certain incandescent lamps of German manufacture are on sale here and have the advantage of using kerosene, which pays a duty of $4.75 for 220 pounds, instead of gasolene, on which the duty is just twice as much. This enables the retailer to sell kerosene at about 8.75 cents per quart as against about eighteen cents for gasolene. The reduction of the duty on gasolene which is being urged by the automobile manufacturers and clubs in this country will be made some time in the not too distant future, and this, of course, would give an impetus to the sale of lamps burning it.

THE ELECTRICAL SUPPLIES BUSINESS.

SOME INTERESTING MATTER CONCERNING PROFITS AND THE GENERAL OUTLOOK.

A matter of great interest to supply men and jobbers is the question of how much profit the jobbers should have on sales. This is a question often discussed, but never decided. A recent communication to the ELECTRICAL REVIEW from a prominent supply man connected with a well-established house has much of interest in it, both for the supply man and the manufacturer. We quote from the correspondence as follows:

"The concern has grown up with the electrical industry and is a fair sample of what is probably recognized as the average supply house. Not small, and not extremely large, it employs fifty hands. Its credit is high and the service given customers of the best quality. No one can enter its employ who has not the requisite education, character and ability for advancement. Its aim has always been to please its customers, not by selling goods so cheap that it could not afford to pay good salaries for competent employés, but by rendering prompt, intelligent service with the minimum of annoying mistakes. Its employés of six to ten years ago are now occupying all the responsible positions, and it trains its employés and pays them such satisfactory salaries that they are not looking elsewhere for positions. The largest single item of expense of this concern is that of salaries, which is about fifty per cent of the total expense. General expenses, such as rent, insurance, advertising, lighting, heating, catalogues, packing materials, stationery, traveling expenses, etc., are about thirty-seven and one-half per cent of the entire expenses, freight and hauling are ten per cent of expenses, postage stamps are about two and one-half per cent.

"The above shows what percentage each expense bears to the total expense of doing business.

"The average cost of doing business in percentage based on the last eight years' sales is fifteen per cent, which does not take into consideration the interest on capital invested, or losses on account of bad debts. The concern turns its capital about six times a year and loses about one-half of one per cent on uncollectable accounts. On this basis and figuring capital as being worth six per cent per annum, the cost for capital on sales amounts to one per cent, and by adding this and the bad debt losses to the fifteen per cent, we have a total of sixteen and one-half per cent on sales, which the jobber must receive before he can figure any profit on the business done. Inasmuch as the above percentages are based on sales and not on cost, it is readily figured that a jobber who should only add twenty per cent to cost would come out about even on his business, after taking into consideration interest on capital invested.

"Of course a concern which acts as manufacturer's agents and sells to other jobbers in large quantities would enjoy a lower expense rate on sales and inevitably a much lower rate of profit on such sales, but expenses and profits on these sales would not materially affect the net results in dollars and cents on what we have in mind as ordinary jobbing business.

"An up-to-date supply house must carry a stock exceeding five thousand different times, which come from at least three hundred different factories. The jobber largely, if not entirely, absorbs what would otherwise be the factory selling costs, and at the same time places the trade in position to get goods locally from hundreds of manufacturers. The legitimate laws of trade in a line so diversified as the electrical business compels the factory to recognize and provide for the jobber, and thereby promote the manufacturer's interest by always having his goods close to the place of consumption. The most prominent and most successful manufacturers in every line of trade, almost without exception, sell their product through the jobbing houses in their particular line of trade. Conceding this to be so, why is it not desirable for the manufacturer to take into careful consideration the jobber's expenses, or what would be his expenses if he were marketing his products immediately at or near the place of use?

"The interests of the electrical business demand a high grade of intelligence, and because of this fact it is not within the proper desire of any one in the business to cripple the service rendered by cutting salaries, and as a result the efficiency of employés, in order to reduce resale prices. The principal opportunity and about the only opportunity the jobber has of reducing expenses, is by giving attention to his salaries, which, as already stated, amount to fifty per cent of his entire expenses. There is no quicker road to business suicide than employing deficient help, unless it is that of selling goods at a price which does not cover the cost of doing business.

"It is and has been a well-established fact that the electrical manufacturing and jobbing business, as a whole, have not paid the profits they should. Electric railways, electric light companies, telephone and telegraph companies, on the average have been extremely successful, but those who made and sold the supplies have not been so fortunate.

"Harmony between jobbers and manufacturers, recognizing the interests of both, must exist before they reap a fair share of the profits to which they should be justly entitled, and from above percentages of expenses it would seem that a jobber's profit, averaging twenty-five per cent on all sales figured on cost or twenty per cent if figured on sales made by him, would not be unreasonable as compared with other jobbers' profit in other lines of trade, such as the wholesale hardware trade, plumbers' supplies, etc."

The recent wide fluctuation in the price of bar copper has created an impression in many quarters that this would affect the price of electrical supplies, particularly those which come under the schedules including receptacles, sockets, clusters, flush switches and other adaptations of brass and copper. An inquiry instituted among a number of prominent supply men appears to indicate that no change in the price of basic staples in electrical production is imminent. About a year ago a horizontal increase in the cost of electrical staples was made by the manufacturers, the supply men making a corresponding increase in their distributing charges. This increase has been maintained, and will very likely hold for at least six months more.

Concerning the statements which have been made, that the electrical manufacturers and supply men will be caught long of high-priced copper, there seems to be no foundation in fact for this understanding. As a matter of fact, the consumers have for some time been aware that a break was near at hand, and very little twenty-six-cent copper has been purchased. Copper has been bought on a rising market, and even where any considerable supply of copper stock at the higher prices is on hand, the profits already made will discount the losses which may be involved.

American Institute of Electrical Engineers.

The first fall meeting for the season of 1907-1908 of the American Institute of Electrical Engineers will be held in the auditorium of the Engineering Societies Building, 29 West Thirty-ninth street, New York city, on Friday, October 11, at 8.15 P. M.

The Lusitania Arrives at New York.

On Friday morning, September 13, the new Cunarder Lusitania reached New York and docked at the new pier prepared for her reception. This vessel is equipped with steam turbines, and it is noteworthy for this fact as well as that she is the largest vessel that has ever been launched. Her dimensions are 790 feet in length, eighty-eight feet in breadth, and a molded depth of sixty feet. Her gross tonnage is 32,500 and displacement 45,000 tons. Her draft, loaded, is thirty-seven feet six inches. A striking feature of this vessel is her height, which makes less noticeable her great length. The height to the top of her funnels is 155 feet.

The first voyage of the Lusitania was followed with great interest on both sides of the Atlantic, because this vessel has been designed to try out the steam turbine for marine work on express steamers. On this voyage she broke several records, in spite of the fact that she was much delayed by fogs, and she reached New York with a considerable part of her coal supply unconsumed, indicating that she was not pushed to the utmost during the first trip. She sailed with remarkable steadiness and but little vibration. The vessel is equipped with quadruple propellers driven by steam turbines, with a total rating of 68,000 horsepower. Her sustained speed is about twenty-five knots, but during the trial trip she attained a speed of twenty-five and one-half knots. The outer propeller shafts are each connected to high-pressure turbines, the inner shafts being driven by low-pressure turbines.

In the construction of this vessel everything has been done on a large scale. The keel-plate is five feet wide, three and three-fourths' inches thick. Associated with this flat keel is a vertical keel five feet wide, one inch thick, and to this are attached frames and beams making up the skeleton of the boat. The double bottom of the vessel is divided by this vertical keel and the transverse frames, making compartments in which water ballast may be carried. The tops of these tanks are carried well around the turn of the bilge, so should the bilge plates be torn away and the hull pierced, entering water could be confined between the inner and outer bottoms. The lower deck of the vessel is also made completely water-tight. She is divided into 175 water-tight compartments, making her, it is believed, unsinkable. The doors communicating between the water-tight compartments are controlled from the bridge, so that any and all of them can be closed automatically in a few seconds.

The passenger accommodations of the vessel are excellent; the cabins and suites are beautifully fitted and provided with all luxuries. Every electrical device tending to comfort has been installed. There are telephones, electric elevators and call systems. Wherever possible, electrical appliances have been installed. As already mentioned, there are pasenger elevators running between the various decks. The cranes and capstans are driven by electric motors, and there is a large number of ventilating fans, also driven electrically. Throughout the vessel special attention has been paid to the electric lighting, the effect everywhere being pleasing and satisfactory. She is, of course, fitted with wireless telegraphy, and during her first trip maintained almost continuous communication with one side of the Atlantic or the other. A good deal of interest was added to her maiden trip by the messages which she sent out from time to time, stating the success of the voyage and the distance which had been covered during the daily run.

To Extend Electric Service.

The public service commission of the Second District, state of New York, has announced that the New York Central & Hudson River Railroad Company will extend electric service to Croton on the Hudson and North White Plains on the Harlem division, providing grade crossing eliminations are ordered for Mount Vernon, Tuckahoe and White Plains on the Harlem division and Ossining and Tarrytown on the Hudson division.

The commission has issued an order for elimination of the three Harlem railroad grade crossings in Mount Vernon, above the New York city line. The De Milt avenue crossing, which is within the city limits of New York, will have to be considered by the First District commission. The order for the elimination of the grade crosings on the Harlem railroad at Tuckahoe has also just been made by the Second District commission.

Nearly all of the questions involved in the elimination of grade crossings in Ossining have been decided and a hearing has been appointed at Albany, September 23, at 2 P. M., when a settlement of the remaining points will no doubt be reached.

The commission is ready to take prompt action regarding the crossings at White Plains and Tarrytown on receipt of definite information from the village authorities.

More Capital for the Allis-Chalmers Company.

Several reports have appeared in the daily newspapers concerning a readjustment of the management and affairs of the Allis-Chalmers Company. A persistent rumor is to the effect that W. V. Kelley, president of the American Steel Foundries Company, and E. H. Gary, chairman of the board of the United States Steel Corporation, were to hold important places on the executive board of the Allis-Chalmers Company. In regard to this plan, E. H. Gary is quoted as saying: "My connection with the Allis-Chalmers Company has been nominal, and there is no intention to make it active. My services are entirely devoted to the United States Steel Corporation. Still, I think, from the reports of the officers of the Allis-Chalmers Company, and from information otherwise received, that it should be very successful if it had a little more working capital, and its management somewhat strengthened. There is no connection between the company and the United States Steel Corporation."

Association of Edison Illuminating Companies.

At the annual meeting of the Association of Edison Illuminating Companies, held at Hot Springs, Va., September 10, 11 and 12, the following officers and directors were elected:

President—Alex Dow, vice-president Edison Illuminating Company, Detroit, Mich.

Vice-President—Gen. George H. Harries, vice-president Washington Railway and Electric Company, Washington, D. C.

Secretary—W. W. Freeman, vice-president and general manager Edison Electric Illuminating Company, Brooklyn, N. Y.

Treasurer—Louis A. Ferguson, second vice-president Chicago Edison Company, Chicago, Ill.

Executive Committee—Charles L. Edgar, Boston, Mass.; Samuel Insull, Chicago, Ill.; J. W. Lieb, Jr., New York city; J. B. McCall, Philadelphia; T. E. Murray, New York city.

Direct Cable to Havana.

On Wednesday, September 11, the cable steamer Silvertown left London, England, with over 1,300 miles of submarine cable to be laid between New York and Havana for the Commercial Cable Company. The object of laying a cable direct between New York and Havana, instead of following the old route between Cuba and Florida, is to give the company better facilities and reduce the time of transmission.

REVIEWS OF CURRENT ENGINEERING AND SCIENTIFIC LITERATURE

An Electrical Installation at Leeds, England.

Probably electric power is used as freely in the district surrounding Leeds, England, as anywhere else in Great Britain. A description of a typical motor-driven shop at the latter city is given here. This is the factory of Greenwood & Batley, where many kinds of machinery, including electrical apparatus, are manufactured. The power-house of this shop is equipped with six DeLaval steam turbines in sizes ranging from forty-five horse-power down to seventy-five horse-power the total equipment having an output of 1,275 horse-power. Each of these turbines drives double armature direct-connected dynamos. These machines supply power and light to the whole of the works and are controlled from a simple switchboard. The shop contains 162 electric motors, ranging from forty horse-power down. As the shop has been changed over from steam driving to electrical driving, the motors have usually been arranged for driving the existing machinery by means of short lengths of shafting already installed, a twenty horse-power motor being usually taken as a unit, and the machinery driven in groups. However, it has been found to be a great saving in power to have each machine tool driven by a separate motor, and in nearly all cases new tools are being so arranged. The wiring of the shops is simple, the cables being carried on cleats upon the roof standards to the various departments where distribution boards are fixed from which cables to the various motors run. Most of the lighting is done by means of enclosed arc lamps operated from special circuits. The turbines operate condensing, water being supplied by means of motor-driven pumps. Feed water is also supplied through motor-driven pumps although a steam-driven pump is held in reserve. Although the turbines are relatively small, their consumption of steam has been comparatively low, being about nineteen pounds per kilowatt-hour, or thirteen pounds of steam per brake-horse-power per hour.—*Abstracted from Electrical Review (London), August 30.*

Practical Telephotography.

A method of transmitting pictures electrically was devised in 1881 by Shelford Bidwell, who here describes it and at the same time gives some interesting particulars regarding Korn's latest method. Bidwell's system was very simple and made use of a selenium cell. Two circuits were arranged, one consisting of the transmitting circuit and the line; the other, of the receiving circuit. Each of these was provided with a battery and arranged so that when the receiving apparatus was shunted across their connections, no current would flow through this device. This was arranged by means of an artificial line resistance at the receiving station, which was adjusted to balance the resistance of the line and the selenium cell. Any variation in this selenium cell then would allow the current to flow through the receiving device. The transmitter consisted of the selenium cell mentioned and a cylinder upon which the picture to be transmitted in the form of a negative was placed. By means of a lens, a small beam of light was thrown through this negative upon the cell, and as the former was moved along, every point of it came in succession under the beam of light. In this way variations in the resistance of the cell, corresponding to the lights and shades of the negative, were brought about. The receiving device consisted simply of the cylinder rotated synchronously with the transmitter. Upon this a sheet of paper was stretched which had been dipped in a solution of potassium iodide. The platinum point rested upon this paper and traced a purple line, whose intensity varied with the current passing through the apparatus. In this way satisfactory reproductions were secured over short distances, but the apparatus was not able to comply with the conditions met on long lines. The system was very simple, the only delicate device used being the selenium cell. About this no particulars are given. Mr. Bidwell describes also one of the recent improvements in Korn's system. When using a selenium cell, a sluggishness, or hysteresis, of the material may render it incapable of responding quickly enough to the variation in the light falling upon it. This sluggishness is quite apart from the almost instantaneous change which does take place, so that by depending upon the latter change only and neutralizing the affect of the former, the best results have been obtained. Korn accomplishes this by placing two receiving instruments in series at the receiving station. One of these produces the photographic reproduction of the picture being transmitted; the other causes a corresponding variation in the light falling upon a second selenium cell connected in the receiving circuit so as to correct for the slow changes in resistance which take place in the transmitting device.—*Abstracted from Nature (London), August 29.*

The Heating of a Balloon Wire by Lightning.

A description of the effect of a lightning discharge which struck a balloon wire, destroying it, is given here by E. Gold, to whom the information was furnished by S. F. Cody. The accident happened in July last to a captive balloon carrying meteorological instruments, when it was at a height of 3,500 feet, and attached to about 4,500 feet of No. 19 Standard Wire Gauge, tin-plated piano wire. The drum to which the wire was attached was well earthed, as it was standing on a large solid iron plate which was buried about a foot and a half in the earth. The flash which struck the wire came in a horizontal direction, followed by a quick stroke to the earth. There was no smoke after the flash, but a deep, hissing noise, caused probably by the falling of the wire. The latter was in many cases driven two or three inches into the earth. The balloon escaped, carrying the instruments, and was not recovered. Upon investigation it was found that, 250 yards from the drum, the wire had become less tempered, so that it would stand bending quite well. At the drum it was fused completely, but was undamaged upon the drum. At the time of the accident the weather was dry and there was a light wind, but there had been no previous lightning. From specimens of the wire it appears that the heat developed was sufficient to melt the tin but not to fuse the wire. By assuming that the process of heating was too rapid for any loss to take place by conduction, it was found that the ergs expended in heat-

ing must have been between a certain point 7.12×10^{12} and 8.28×10^{13}. Or, assuming the height of the cloud to be 100 metres, the energy was sufficient to raise 73 kilogrammes, but not sufficient to raise 840 kilogrammes to the cloud level. The fact of the wire being less brittle in the lower portion points to the diminution of the energy developed, but no reasonable explanation of this is apparent unless it was due to an induction effect. A somewhat similar accident happened in April of this year, but in that case the wire was completely fused from the balloon to the winding-drum. The length of this wire was about one-half mile and the balloon about 2,000 feet up.—*Abstracted from Nature (London), August 22.*

Three-Phase Power Supply of the Manchester Corporation.

The concluding part of the description of the interesting three-phase power supply of the Manchester, England, Corporation is given here. One feature of this system which has attracted attention is the fact that Manchester has always been considered a stronghold of the direct-current system, so that the introduction of the three-phase system seems a departure from the usual trend of development. The work of installing the alternating-current system has been going on for the past five or six years. In certain installations, both alternating-current and continuous-current supply are needed from the three-phase mains, and both static transformers and converting plant are required in one station. In a typical substation for this purpose the high-tension switchboard is arranged to divide off the static transformers from the rest of the station at one end. The motor converters occupy the other end. One of these stations contains six 150-kilowatt static transformers, and two 200-kilowatt motor converters, giving a total equipment of about 1,300 kilowatts. The high-tension switchboard contains two feeder panels, a total output panel, two three-phase static transformer panels with control for six transformers, and two motor converter panels. The feeder panels each have a hand-operated oil-switch and transformers are each fitted with a double-pole oil circuit-breaker. The motor converter panels provide for a single triple-pole circuit-breaker on each panel and an overload relay. The cable connections between the high-tension switch panels and the static transformers are laid in trenches, as are also the cables between the motor converter panels and the machines. The agreements made by the Manchester Corporation with consumers taking supply arrange that the station built shall be supplied by the consumer. Unless special provision is made, the corporation furnishes the transformers, either static or rotary, the high and low-tension switchboards, and the cable connections between these and the plant. It is estimated that the cost to the corporation for these installations is about $10 a kilowatt for static transformers and $16 when motor converters are used, for installations of 500 kilowatts. The number of power consumers on the three-phase mains is at present ten, and the equipment of the substations amounts to 7,160 kilowatts; about 3,800 kilowatts of this total is in motor converters. The combined consumption of these ten consumers is over twelve million kilowatt-hours a year. This power is used in two spinning mills, a wire works, a locomotive works, armor plate works, chain works, electric motor makers, machine tool makers, chemical works, etc. The motors employed range in size from seven and one-half horse-power to 150 horse-power; the largest induction motor having the latter rating. A number of other firms applied for power, and will be supplied as soon as practicable.—*Abstracted from the Electrician (London), August 30.*

An Electrical Agricultural Installation in Saxony.

A group of farmers situated to the West of Halle in the Province of Saxony employ electric power for doing much of their work. D. S. Paxton describes here the equipment employed for this purpose. A supply of three-phase current at 3,000 volts is obtained from the Mansfield electrical company by means of an overhead line mounted on wooden poles, except where it is necessary to cross a street, when underground cables are employed; but the greater part of its length is across open country, and is protected by lightning arresters of the horn type. No special protection against falling wires has been employed except where the poles are erected along a road, when a protecting net, consisting of three wires stretched longitudinally with cross wires at frequent points, is erected. Two transforming stations have been equipped at Volkstedt and Polleben, and in addition to the low-tension lines emanating from these several high-tension lines have been carried to convenient points in the fields, for the operation of threshing machinery at harvest time. The Volkstedt transformer house contains five transformers in all, two rated at sixty kilowatts each, one at forty kilowatts and two at twenty kilowatts. The first three reduce the pressure from 3,000 volts to 500 volts for the power circuit. The other two reduce it to 220 volts for lighting. The transformer house at Polleben has a somewhat smaller equipment, containing but two forty-kilowatt transformers for the power supply and two ten kilowatts for lighting. The total power connections to the two stations comprise sixteen fixed motors at a total rating of about 140 horse-power. These drive chaff and root cutting and oat crushing machines, pumps and a number of machines in connection with a potato alcohol distillery. On the lighting circuits there are nine arc lamps and about 1,000 incandescent lamps. There is also an extensive system of wiring both on the power and lighting circuits to plugs at convenient positions, so that power and light are available at practically any point in the precincts of the farm buildings. There are six portable motors mounted in vans which are used for driving the various machines. One of these drives a circular saw, one a pump, another a band saw, etc. The distributing lines are partly overhead and party underground. A large proportion of the interior wiring for lighting stores, etc., is carried out by means of bare tinned copper wires supported on porcelain insulators. The exterior arc lighting is also carried out largely from bare overhead wires. Power is obtained from the high-tension distributing lines mentioned above by means of connecting boxes mounted on special poles, erected immediately beside the last pole of the transmission lines. A triple-pole, high-tension switch is attached to this special pole, and is worked by a lever, the motion of which is transmitted to the switch lever by means of two wires, each intersected by porcelain insulators. The box is so arranged that it can be opened only when the switch is open. To utilize the power in these high-tension circuits, portable transformers are used, reducing the voltage to 500. Each of these is rated at forty kilowatts and is mounted on a strong wagon. A recording wattmeter is mounted on this wagon and a reel is attached containing about 1,500 feet of heavily armored low-tension cable. The high-tension cable provided with each transformer is only sufficient to reach from the transformer wagon to the terminal box when the former is placed immediately at the special pole. It is said that this installation has fully met the expectations of those who installed it, and has operated with considerable economy and much saving of time.—*Abstracted from Electrical Engineering (London), August 29.*

INDUSTRIAL SECTION

ILLUSTRATED DESCRIPTIONS OF NEW AND STANDARD ELECTRICAL AND MECHANICAL APPARATUS

Westinghouse Integrating Wattmeters.

The Westinghouse Electric and Manufacturing Company, Pittsburg, Pa., has placed at the disposal of central station managers a fine line of accurate wattmeters embracing a number of types adapted to the different classes of circuits and to different services. There is the type C for alternating-current circuits, single or polyphase, for house or switchboard service. The single-phase house service meters have glass or metal doors, and are arranged for two or three-wire service as desired. A prepayment meter for alternating current, the demand for which is constantly increasing, is available, and there are also a portable standard integrating wattmeter for alternating currents and a direct-current wattmeter for two or three-wire service.

FIG. 1.—TYPE C, SINGLE-PHASE WATTMETER WITH METAL COVER.

The type C meters are made to include all classes of alternating-current service, with an extensive range of voltage, frequency and capacity, for two and three-wire, single-phase systems and for polyphase systems for house service, supplemented by a second form intended for switchboard mounting. The principle of operation is the same for all styles of type C meters. These meters operate on the induction motor principle.

The moving element consists of a disc and shaft only. The disc is made as light as is consistent with mechanical strength, the accuracy of this meter at light loads being largely due to the light weight of the moving element. There are two coils connected in series with the line and one coil connected in shunt. The coils are form wound, and the iron cores are laminated. The three coils produce a rotating field which induces eddy currents in the disc and causes rotation in the same manner as the primary of an induction motor causes the secondary to rotate. Fig. 1 shows the type C single-phase wattmeter with metal cover.

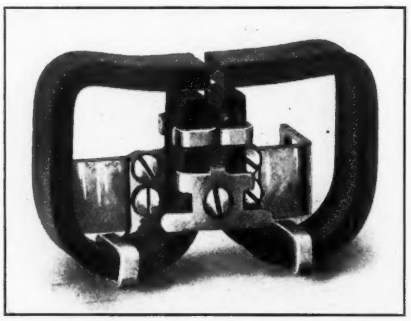


FIG. 2.—RETARDING MAGNETS.

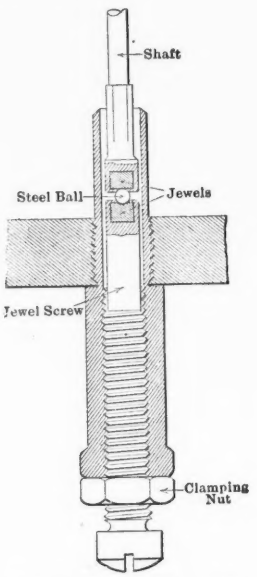


FIG. 3.—LOWER BEARING.

The retarding magnets are made from a grade of steel that has been adapted for this class of work after years of investigation. The magnets are placed at the disc diametrically opposite to the operating coils and retard the disc motion by induced current. The retarding force is directly proportional to the speed of the disc, and as the torque of the meter and the speed are proportional to the load, the reading of the meter follows closely a straight line law. The effect of this retarding force can be decreased by moving the permanent magnets toward the disc centre, or can be increased by moving the magnets toward the circumference of the disc. The disc is pressed from a sheet of aluminum, and has ridges formed on the surface, thus truing, balancing and stiffening the disc. A black mark is visible on the edge of the disc when the meter is operating, so that the revolutions may be counted for purposes of test. Fig. 2 shows the retarding magnets.

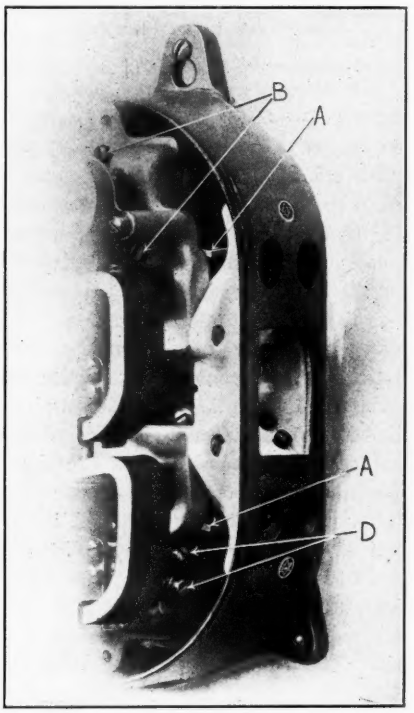


FIG. 4.—SECTION OF POLYPHASE OPERATING ELEMENTS.

The bearing is equipped with a single ball and cupped sapphire jewels. The construction of the bearing is shown in Fig. 3.

The individual wheels of the wheel train are made to gauge and carefully fitted, the complete train operating with precision and exactness.

The dials are furnished for a number

of capacities and read direct in kilowatt-hours without requiring the use of a constant.

The meter may be secured to any vertical surface, three holes for mounting screws being provided for this purpose.

The operating parts and permanent magnets, wheel train, dial and bearings are supported by a cast-iron frame secured to the case.

Connecting leads are brought in at the top of the meter and secured to the terminals, which are insulated by heavy fibre blocks.

Fig. 4 shows a section of a polyphase operating element. The polyphase wattmeter consists of two single-phase meter elements with two discs mounted on one shaft and registering the load with one dial for either two or three-phase. The construction requires a modified form of case, and the increased number of leads make a change in the terminal boxes necessary. Two entirely separate porcelain blocks are used, situated at a mid position on both sides of the meter and fitted with metal covers arranged for wing nut seals.

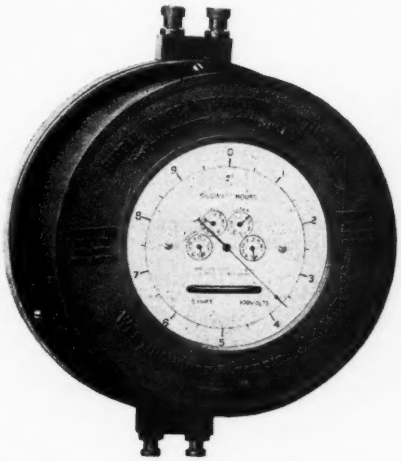


FIG. 5.—TYPE C, SINGLE-PHASE WATTMETER FOR SWITCHBOARD SERVICE.

The case is entirely of metal, and the cover is in one piece. The case supports the internal parts and provides the mounting lugs. The cover is held in position by ball rods top and bottom, which are provided with wing nuts and seals. The performance of this meter is similar in all respects to that of a single-phase instrument, and the power registered on the shunt dial is the entire true amount consumed in all phases of the circuit at any power-factor.

Fig. 5 shows the type C single-phase wattmeter for switchboard service. This is an adaptation of the standard type C mechanism into a special form more properly fitted for switchboard service. It is adapted for mounting directly upon the panel, and connections are made to the circuit by means of binding screw terminals above and below. The upper terminals are for the potential leads, and the lower terminals for the current leads. The characteristic feature of the switchboard meter is the enlarged circular dial.

Fig. 6 shows the alternating-current prepayment wattmeter. This consists of a meter element and a prepayment attachment. The prepayment attachment disconnects the line when the amount of electrical energy equals the amount of money deposited at a given rate per kilowatt-hour. The prepayment feature adapts this type of meter for installations where the ordinary wattmeter would not give satisfactory service, and where there would be no simple means of charging for the current, as in meeting halls, stores and offices which rent for short periods to different parties. Only such an amount of

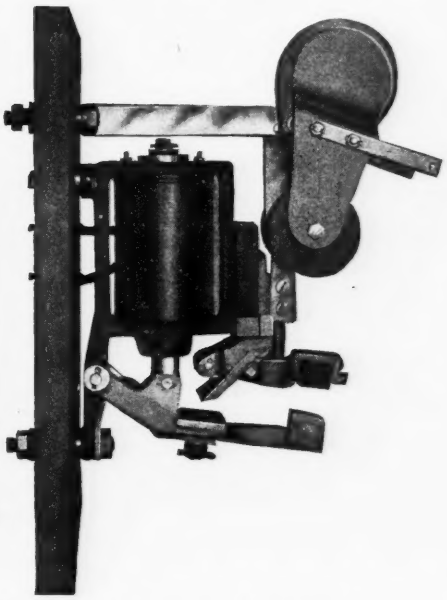
FIG. 6.—ALTERNATING-CURRENT PREPAYMENT WATTMETER.

current is supplied as has been paid for in advance. Payments may be made before the full amount of current previously paid for has been consumed. Payments are made with twenty-five-cent pieces, and the amount of current paid for is indicated by the large hand on the dial. Any payment up to a total amount of $2.50 may be made at one time, at which point the hand indicates full, and further payments will not be registered.

Improved Contactor.

The Cutler-Hammer Manufacturing Company, of Milwaukee, Wis., maker of electric controlling devices, has recently placed on the market an improved type of contactor. These contactors are used for handling main-line currents where the nature of the service is severe. In such cases it is customary to employ a controlling panel consisting of a number of contactors, this panel in turn being controlled by a master controller designed to regulate the secondary current, which energizes the solenoids of the contactors.

The improved contactor here illustrated is a compact and strongly constructed piece of apparatus, and is provided with an exceptionally powerful blow-out magnet. The main-line circuit is closed by the solenoid raising a pivoted arm, carrying a thick copper plate, to a point where contact is made with a pair of stationary, laminated copper brushes. Arcing on this contact is prevented by providing an auxiliary copper and carbon contact in the field of a powerful blow-out magnet, which instantly extinguishes the arc incident to the breaking of the circuit. This auxiliary contact closes before the main contact is made and opens after the main contact is broken, thus effectually preventing any sparking on the main contact.



IMPROVED CONTACTOR.

A noteworthy improvement is the pivoting of the blow-out shields, permitting these to be raised (as shown in illustration) so as to expose the auxiliary carbon and copper contact. The present construction makes renewal of either contact, or of the coiled spring (visible just above the carbon contact), a matter of a few moments only. At a recent test at one of the largest Pittsburg steel mills a 220-volt circuit was opened and closed by a contactor of this type 88,000 times before renewal of the copper and carbon contacts became necessary, and —on a test to determine time required for repairs—the old contacts were removed and new ones inserted in less than two minutes.

The Holophane Company.

The sales force of the Holophane Company has recently been augmented by Morgan P. Ellis and Harry P. Struben. The former comes from the Electric Appliance Company, of Chicago, and will travel the northwestern states. Mr. Struben was, until lately, connected with the engineering department of the Pennsylvania Railroad Company, with headquarters at Baltimore. He will have the southwestern territory for Holophane.

The large number of gas and electrical engineers, architects and central station men who are becoming interested in illuminating engineering, and who call upon the Holophane Company for data on this science, has led to the engagement by the company of T. R. Pemberton, in the position of office salesman and demonstrator. The Holophane Company has a very complete demonstration room, in which the illumination value of its product is shown.

The company has added to its engineering department, T. W. Rolfe, engineer, and C. W. Heck, designer.

Mr. Heck resigned from the Safety Car Heating and Lighting Company to establish a department of special fixture designing for the Holophane Company, this department being necessary to take care of the growing number of large lighting installations being handled by the Holophane illuminating engineers.

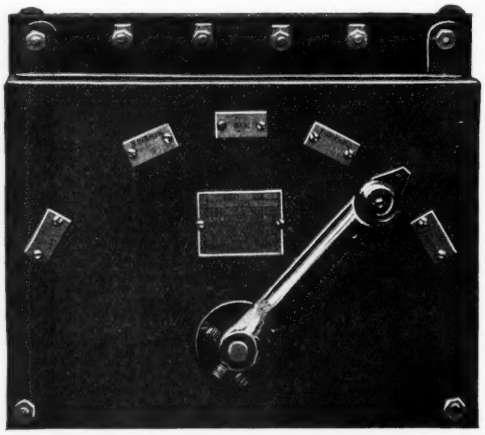
An Insulating Pipe Covering.

The H. W. Johns-Manville Company, 100 William street, New York city, is placing on the market a sectional covering of a specially prepared asbestos paper in a laminated form, thoroughly impregnated and coated with a high-grade waterproof insulating compound which presents an effective barrier to the transmission of electric current. This is designated as "Electroless" pipe covering. It acts as an insulating medium between the pipe and ground, and, being made of indestructible materials, is permanently durable and has a lasting efficiency.

"Electroless" pipe covering is one-quarter to three-eighths of an inch thick, and is furnished in sections three feet long to fit various sizes of iron and lead pipes. All longitudinal and abutting joints are securely sealed by means of strips and insulating cement, which are furnished with the covering. For sleeve coupling a special sleeve of "Electroless" pipe covering is provided.

Ward Leonard Reversing Motor-Starters.

The accompanying illustrations show two views of the ERSU type three-horsepower, 220-volt reversing motor-starter made by the Ward Leonard Electric Company, Bronxville, N. Y. This reversing starter is a combination of two distinct no-voltage-release motor-starters mounted on one slate and operated by one controlling lever. The controlling lever will start the motor in either direction of rotation. If the motor is running in one direction, the movement of the controlling lever to its initial position stops the motor. The further movement in the opposite direction reverses the motor. It is impossible to cut out the resistance of each starter at the same time, for the controlling lever is always interlocked with either one or the other of the movable levers, except when both levers are in the open-circuit position. The movement of the two movable levers in opposite directions to cut out resistance opens the circuit of each starter —that is, in order that either starter can be used, the reversing lever must be in its open-circuit position. This starter can be used to start in either direction of rotation any kind of a continuous-current motor, whether shunt, series or compound-wound; whether separately excited or any other type. The resistance is entirely enclosed, moisture-proof and fireproof. The face plate is covered with a sheet-metal enclosing case, and the rheostat should fulfil the underwriters' rules covering enclosed rheostats or cabinets for use in dusty or linty places.



WARD LEONARD TYPE ERSU REVERSING MOTOR-STARTER.

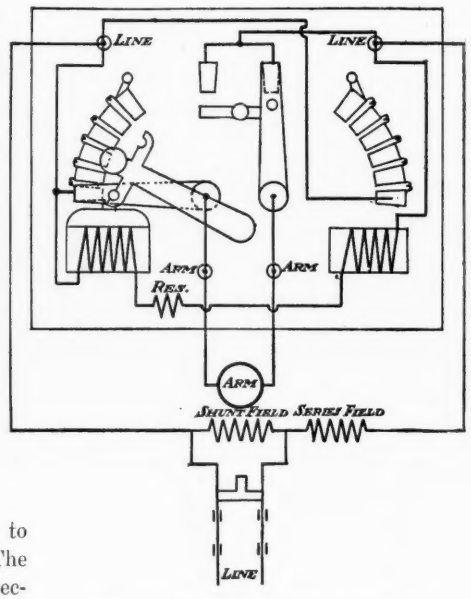


DIAGRAM OF CONNECTIONS, TYPE ERSU REVERSING MOTOR-STARTER.

Chicago Edison Company stockholders at a meeting on Monday, September 16, voted unanimously for a consolidation with the Commonwealth Electric Company. Edison stockholders receive $160 in new stock for each $100 of present holdings and sixty per cent additional in trust certificates.

Allis-Chalmers Machines in Coke and Coal Mines.

The Allis-Chalmers Company, Milwaukee, Wis., as has been noted in previous issues, has made extensive installations in coke and coal mines throughout the country, among which may be mentioned tthe following:

The Monongehela River Consolidated Coal and Coke Company is now installing two 200-kilowatt engine-type generators at the Gallatin plant, Milesville, Pa.

The Elkins Coal and Coke Company, at Morgantown, W. Va., has an order equipment for its mining operations. The present contracts call for one 200-kilowatt, twenty-five-cycle, 2,300-volt, three-phase, engine-type alternator and one 200-kilowatt rotary converter, three seventy-five-kilowatt transformers, one 300-horsepower, 2,200-volt, rotor-type induction motor and one twenty-horse-power induction motor. For several years the company has been using two 125-horse-power direct-current motors for driving crushers.

At Du Bois, Pa., the Buffalo & Susquehanna Coal and Coke Company has installed three compound compressors for coal-mining operation; compressed air in this particular installation being preferable to electricity.

The Jones & Laughlin Steel Company has purchased a 500-kilowatt synchronous motor-generator set for supplying power for the operation of coke ovens at its new works at Aliquippa. It may be of interest to note that the synchronous motor-generator set receives twenty-five-cycle, three-phase current at 6,600 volts from the

main power plant, which has a large capacity in Allis-Chalmers engines and generators.

The River Coal Company and National Mining Company together, which are subsidiary to the steel corporation, have a total of about 400 horse-power in direct-current motors driving crushers.

The Norfolk & Western Railway Company has a total of over 400 kilowatts in generating capacity in the West Virginia coal fields.

The Holmes & Allen Under-running Trolley Head.

The accompanying illustrations show two views of the flexible under-running trolley head designed and manufactured by Holmes & Allen, of Wellington, New Zealand. One of the serious troubles incident to the operating of overhead trolley systems is the jumping of the trolley wheel from the wire, especially at high speeds or when passing cross-overs which may be slightly out of line. The under-running trolley head here described is so arranged that no matter what the speed of the car, the grooved trolley wheel follows the conformation of the wire, taking the turns and cross-overs with but little bumping, and the effect of such bumping is so cushioned that the grooved wheel always hugs close to the trolley wire. In numerous private and official trials in Australia it is stated that it has been found impossible to dislodge this trolley even by excessive driving upon down grades.

SIDE VIEW OF FLEXIBLE UNDER-RUNNING TROLLEY HEAD.

With this trolley head a V-type trolley wheel is used, which fits the wire and swivels with it. The wheel spindle is carried in two sliding blocks resting in guides, which, by the aid of light springs, keep the wheel normally in alignment. These springs are under compression while the wheel is on the wire, and therefore compensate for any irregularities in running.

Beside the under-running type of head which is here described, Holmes & Allen also having patented a non-fouling swiveling head. This head has met with great success. One of the most important claims for this type of trolley head is that it allows side-pole construction, giving the trolley wire a displacement of as much as eight feet from the centre of the track.

It is stated that the use of these trolley heads will effect a saving on a 100-car system of at least $5,000 a year. Garnet B. Holmes, one of the inventors, is at present in New York city, making his headquarters at 116 West Seventy-ninth street, arranging for trials of the apparatus and also negotiating the organization of a company to manufacture and install the devices in the United States. The inventors have sold a six months' option of the European rights of this patent for $7,250. It is expected that the syndicate which purchased this right will realize handsomely, the patentees receiving half of the profits of each installation.

TOP VIEW OF FLEXIBLE UNDER-RUNNING TROLLEY HEAD, SHOWING DISPLACEMENT OF TROLLEY WHEEL.

Commercial Electric Ranges.

The accompanying illustrations show two forms of electric ranges manufactured by the Manhattan Electric Range Company, 150 Nassau street, New York city. Fig. 1 shows a broiler and salamander set designed and built for the Plaza Hotel, Fifty-ninth street and Fifth avenue, New York city. This set is finished in Russia iron with tile ends and polished-steel frame, and operates on 110 volts. Fig. 2 shows a standard range designed to cook for from six to fifteen persons. The total capacity is nine kilowatts, and it operates on fifty to 220 volts, either alternating or direct current. The range is finished in Russia iron, nickel or polished steel.

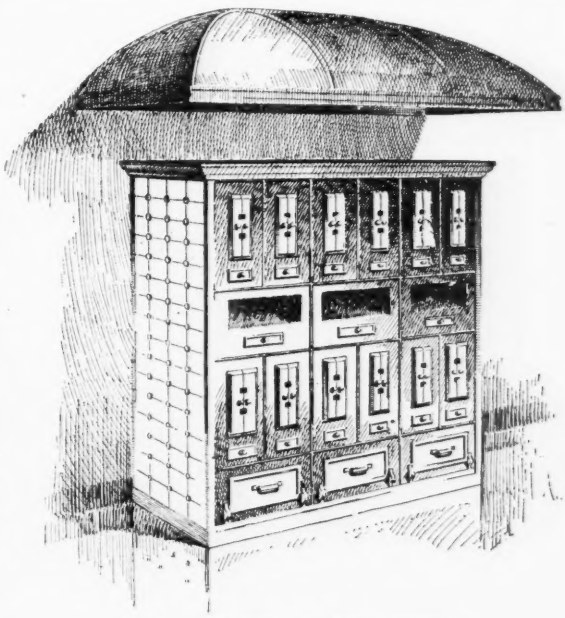


FIG. 1.—BROILER AND SALAMANDER.

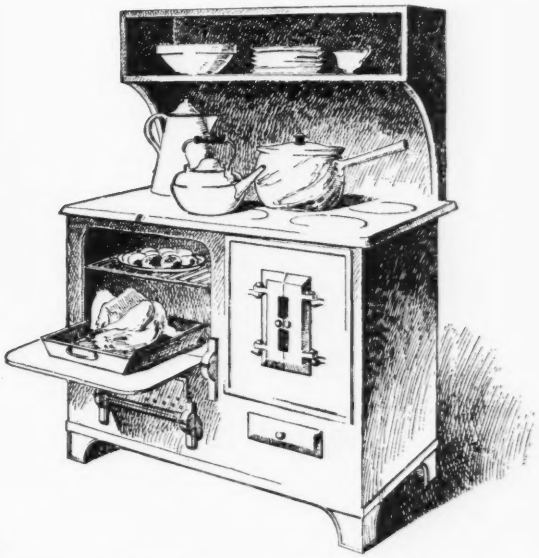


FIG. 2.—STANDARD ELECTRIC RANGE.

Current Electrical News

DOMESTIC AND EXPORT.

MILWAUKEE NORTHERN MORTGAGE — The Milwaukee (Wis.) Northern Railway Company has filed a mortgage to the Fidelity Trust Company, of Wisconsin, as trustee, to secure an issue of not exceeding $4,000,000 first mortgage thirty-year five per cent gold bonds. The company is authorized to construct and operate an electric railway between Milwaukee, Sheboygan and Fond du Lac, Wis.

NEW TELEGRAPH COMPANY—J. P. Hornaday, formerly of Cincinnati, Ohio, is promoting a new telegraph company. The announcement of the projected new company was first made in Chicago by L. K. Davis. It is to be called the American Union Telegraph Company, with a capital of $5,000,000. Mr. Davis says the new company will be ready to begin operations by January 1. The plan is to lease telephone wires and use them as telegraph lines.

MEXICAN LIGHT AND POWER COMPANY TO INSTALL NEW PLANT—Charles H. Cahan, general attorney and resident director of the Mexican Light and Power Company, Limited, has arrived in Mexico City from Montreal, after an absence of two months. Mr. Cahan says that the board of directors of the Mexican Light and Power Company has decided to push the work on the second hydraulic installation on the Necaxa river, near Huauchinango, and for the purposes of the company in Mexico has issued additional stock to the amount of $2,400,000, gold, which has been taken up at par in Montreal and London. The installation at Huauchinango is to be a duplicate of that at Necaxa, and in the neighborhood of $5,000,000, gold, will be spent on it. The work will be in charge of R. F. Hayward, general manager of the company.

ASSENT TO TELEPHONE REORGANIZATION—Prominent bondholders of the United States Independent Telephone Company have filed notice of their acceptance of the plan for reorganization. They have made good their notice of intention to support the plan by subscribing for the full amount of the bonds of the proposed new corporation to which they are entitled. Among those who have subscribed are Hiram W. Sibley, James S. Watson, George Eastman, Walter B. Duffy, Granger A. Hollister, James G. Cutler, William F. Balkam, Herman C. Cohn, Henry S. Cohn, Thomas F. DeVine, Bernard F. Devine, S. L. Elsner, Simeon Adler, H. F. Atwood, Gustav Erbe, George R. Fuller, Isaac Gibbard, William S. Hale, Walter S. Hubbell, Charles J. Bissell, C. H. Huttig, Dr. J. M. Lee, Charles A. Menter, Edward W. Peck, Lucius W. Robinson, Fred S. Todd, John P. Weston, Philip H. Yawman and Joseph W. Taylor. The members of the reorganization committee have sent out to the bondholders a lengthy letter outlining the reorganization plan in detail.

RECEIVER FOR GEORGIA ELECTRIC COMPANY—The North Georgia Electric Company has been placed in the hands of a receiver on a petition of Elwood Allen and W. D. Chamberlain, of Dayton, Ohio, and the Western Union Telegraph Company. The North Georgia Electric Company has a plant of 50,000 horse-power capacity on the Chattahoochee river and sells power to a number of points near Atlanta. Samuel C. Dunlap, of Gainesville, was appointed temporary receiver. The allegation is made that the defendant company owes more than $1,000,000, and that it has "practically ceased all efforts to develop its water power." Differences of opinion between the officers and stockholders are alleged to exist, and it is stated that the interest account of the company is $60,000 per annum. Further statements were made in the petition to the effect that there are outstanding $650,000 of bonds on what are designated as the Dunlap, Wilson, Etowah and Southern Light and Power properties. It is alleged that during the year 1906 the company proposed an issue of bonds to the amount of $7,500,000, and made its deed of trust to the Knickerbocker Trust Company, of New York, to secure this issuance, and that upon this deed $400,000 of bonds have been issued. It is charged that the interest is overdue on a large number of these securities.

NEW COLORADO POWER COMPANY ORGANIZED—Formal organization of the Summit Power Company was perfected on September 7, at Denver, Col., under the legal direction of Charles A. Frueauff, formerly of Denver, now counsel for Henry L. Doherty & Company, of New York, by the election of the following officers and directors: Henry L. Doherty, president of the Denver Gas and Electric Company, and of a number of other gas and electric properties throughout the East, chairman of the board; William J. Barker, president of the Northern Colorado Power Company, and vice-president and general superintendent of the Denver Gas and Electric Company, president; W. C. Sterne, vice-president and general manager; Frank W. Frueauff, vice-president of the Denver Gas and Electric Company, and a number of other gas and electric companies, treasurer; John T. Brady, treasurer of the Denver Gas and Electric Company, assistant treasurer; C. N. Standard, secretary of the Denver Gas and Electric Company, secretary; George S. Pearson, assistant secretary; Norman G. Kenan, president of the Union Gas and Electric Company, of Cincinnati; Emile Maertens, of Providence, R. I., president of the Connecticut Power Company; Senator R. J. Bardwell, of Denver. A great water power plant at Dillon, in Summit county, will be the source of a supply of electrical power for the Argentine, Montezuma, 'Frisco, Kokomo, Dillon and Breckenridge mining districts, on a basis that will cause the opening of new mines, as well as the increased development of those now in operation. Machinery to the value of more than half a million dollars has been ordered.

PERSONAL MENTION.

MR. JAMES F. McLAUGHLIN, Philadelphia, Pa., will, it is announced, succeed John C. Sager as chief of the Philadelphia Electrical Bureau.

MR. E. L. HAINES, vice-president and general manager of the National X-Ray Reflector Company, Chicago, Ill., was a visitor at the Electrical Show and Canadian Electrical Association convention in Montreal last week.

MR. J. N. SHANAHAN has been made general manager of the Washington, Annapolis & Baltimore Electric Railroad Company's line between Baltimore and Annapolis, Md. The company expects that the road between these points will be in operation within ninety days.

MR. J. M. BRADLEY, superintendent of the electrical department of the Birmingham Railway, Light and Power Company, Birmingham, Ala., has resigned to engage in other business. Mr. Bradley has been connected with the Birmingham company and its predecessors for twenty-two years.

MR. I. H. McEWEN has been appointed assistant superintendent of the West Shore Railroad between Utica and Syracuse, N. Y., in charge of the affairs of the Oneida Railway Company. The appointment was made by Division Superintendent F. H. Harrington, of the Mohawk division of the New York Central Railroad. Mr. McEwen has been identified for some time with the office of General Superintendent J. H. Hustis, of Syracuse, as general agent.

MR. W. A. TEN WINKEL, publicity manager of the Electric Controller and Supply Company, of Cleveland, Ohio, was married on Wednesday, September 4, in Cleveland, to Miss Mabel Bucholz. Mr. and Mrs. Ten Winkel have been making an extended wedding trip and are now visiting New York. Congratulations to Ten Winkel. Everybody knows him and everybody likes him. Mr. Ten Winkel has been very successful in creating for his company a strong line of advertising that is producing very satisfactory results.

NEW INCORPORATIONS.

MILWAUKEE, WIS.—The West Wisconsin Telephone Company, Glenwood. An amendment increasing its capital from $7,000 to $12,000.

DENVER, COL.—The Black Cloud Power Company, Denver. $50,000. Incorporators: Lester A. Newell, James K. Robinson and Arthur Ponsford.

OXFORD, MISS.—The electric light plant at the University of Mississippi was burned recently, entailing a loss of $10,000, not covered by insurance.

JERSEY CITY, N. J.—Merchants' Electric Light and Power Company. $250,000. Incorporators: Frank H. Lowrie, Richard S. Karrick and J. R. Blinck.

BRITT, IOWA—The city council has contracted with the Britt Light and Power Company for forty-candle-power lamps to be put at nearly every corner in the town.

PITTSBURG, PA.—Franklin Electric and Construction Company, Pittsburg. $5,000. Incorporators: H. J. L. Booth, Thomas G. Hodgdon and E. Zachausas, Pittsburg.

MILWAUKEE, WIS.—The Superior Rural Telephone Company, town of Superior, Douglas county. $2,500. Incorporators: George H. Selden, Riley S. Hartley and Henry Ward.

JERSEY CITY, N. J.—The Bath Electric Service. To construct and operate electric light, gas, water and power plants. $100,000, divided into 1,000 shares of the value of $100 each.

AUSTIN, TEX.—Ferris Light and Power Company, of Ferris, Ellis county. $4,000. Incorporators: W. W. Batchlor, C. A. Weatherford, J. S. Wilson, C. N. Brooks and John V. Jones.

HARRISBURG, PA.—People's Bell Telephone Company, Edinboro. $6,000. Incorporators: M. S. Gillespie, Joseph Taylor, E. W. Marsh, Edinboro; A. A. Culbertson, Erie; John A. Day, Youngsville.

HARRISBURG, PA.—Conocheagne Electric Light, Heat and Power Company, Markes. $30,000. Incorporators: E. B. Duehl, Lehmasters; Seth Lemaster, Markes; D. F. Metcalfe, Mercersburg; John A. Diehl, Marion.

MADISON, WIS.—The Marquette Telephone Company, Montello; $5,000; incorporators, M. H. Pratt, Jennie Wood and Dr. F. C. Wood. The Rice Lake & Northeastern Telephone Company, Rice Lake; $10,000; incorporators, W. H. Bundy, L. S. Everts and J. E. Horsman.

ELECTRICAL SECURITIES.

The advance in market prices was not sustained last week; in fact, there was a decline registered in several important industrials. The decline centred principally in the copper and metal stocks, but later extended to include a large portion of the entire list. One of the features of the week's activity was the break in copper prices and the semi-official announcement that some of the producers, notably the Amalgamated, would shut down a part of their mines. The successful flotation of the New York city bond issue was another important development of the week. Outside of the satisfaction of putting out the entire issue at a small premium, it showed that when the proper inducement is made, there is any amount of money available. Business in general continues to be good, and it is estimated that both the cereal and cotton crops will prove of bounteous dimensions. The summer, although late in arriving, has been late in departing, and it is presaged that if frost is held off for another week that there will be a bumper corn crop. The harvesting of the wheat crop is already well under way. It is estimated also that, due to the poor showing made by crops abroad, there will be a call upon this country for agricultural products to the amount of at least $200,000,000. The August pig iron statistics show a production of 2,250,000 tons, or a decrease of only 5,190 tons from the output for July, whereas a much larger contraction had been predicted. The legal victory of the Pennsylvania Railroad in receiving a decision declaring the Pennsylvania state two-cent fare bill unconstitutional was also a favorable development, and indicates the attitude of the judiciary as opposed to reckless legislation.

Dividends have been declared on several important systems, among which may be mentioned the following:

The Cumberland Telephone and Telegraph Company; regular quarterly dividend of 1¾ per cent, payable October 1.

Manila Electric Railroad and Lighting Corporation; regular quarterly dividend of 1 per cent, payable October 1.

The Capital Traction Company, of Washington; regular quarterly dividend of 1½ per cent, payable October 1.

New Orleans Railway and Light Company; quarterly dividend of ⅝ per cent, payable October 15 on $10,000,000 preferred stock to holders of record on September 30.

Cincinnati Street Railway Company; regular quarterly dividend of 1½ per cent, payable October 1.

Cincinnati Gas and Electric Company; regular quarterly dividend of 1⅛ per cent, payable October 1.

ELECTRICAL SECURITIES FOR THE WEEK ENDING SEPTEMBER 14.

New York:	*Closing.*
Allis-Chalmers common	6¼
Allis-Chalmers preferred	18
Brooklyn Rapid Transit	44
Consolidated Gas	104½
General Electric	123
Interborough-Metropolitan common	8½
Interborough-Metropolitan preferred	26
Kings County Electric	110
Mackay Companies (Postal Telegraph and Cables) common	63¼
Mackay Companies (Postal Telegraph and Cables) preferred	63
Manhattan Elevated	114
Metropolitan Street Railway	45⅛
New York & New Jersey Telephone	100
Western Union	76
Westinghouse Manufacturing Company	133

The guaranteed quarterly dividend of 1¾ per cent on the capital stock of the Manhattan Railway Company will be paid October 1 to stockholders of record at the closing of transfer books on September 13. Books will reopen on September 25.

The total orders booked by the Westinghouse Electric and Manufacturing Company during August amounted to $4,000,000, which includes several large contracts with eastern railroads. The shipping department has been pushed to its utmost to catch up with orders and during August sent out an average of twenty-eight cars per day, which is equivalent to considerably over 10,000 tons of material for the twenty-seven working days.

The directors of the Western Union Telegraph Company have declared the regular quarterly dividend of 1¼ per cent on the capital stock, payable October 15. Books closed September 20 and will reopen October 11. For the first time in a long period Western Union officials have decided to issue no quarterly statement for the three months ended September 30. It has been the custom of the company for many years to issue regular quarterly statements of earnings. No reason has as yet been given for this action.

Boston:	*Closing.*
American Telephone and Telegraph	105½
Edison Electric Illuminating	200
Massachusetts Electric	48
New England Telephone	108
Western Telephone and Telegraph preferred	—

The annual report of the Edison Electric Illuminating Company of Boston for the year ended June 30, 1907, is as follows: gross, $4,020,620; expenses, $2,591,823; net, $1,428,797; other incidentals, $41,340; total net, $1,470,137; interest, $176,451; balance, $1,293,686; dividends, $1,304,283; deficiencies, $10,597; previous surplus, $213,409.

Philadelphia:	*Closing.*
Electric Company of America	9
Electric Storage Battery common	45
Electric Storage Battery preferred	45
Philadelphia Electric	7⅝
Philadelphia Rapid Transit	19⅛
United Gas Improvement	85½

The directors of the United Gas Improvement Company have declared a quarterly dividend of 2 per cent (one dollar per share), payable October 15, to stockholders of record at the close of business September 30.

Chicago:	*Closing.*
Chicago Telephone	116
Chicago Edison Light	135
Metropolitan Elevated preferred	60
National Carbon common	72
National Carbon preferred	112

ELECTRIC LIGHTING.

PETALUMA, CAL.—The Pacific Gas and Electric Company has awarded a contract to the Globe Construction Company to erect a substation building on First street.

ALBANY, N. Y.—The Schaghticoke Electric Power Company has filed with the secretary of state an amended certificate of incorporation extending the operations of the company to the counties of Schenectady and Montgomery.

TOLEDO, IOWA—The city council has entered into a new lighting contract with the Tama & Toledo Electric Light and Railway Company which will give the city the same amount of light at about one-fourth the cost. This will also apply to commercial business.

STERLING, COL.—The Sterling Electric Light Company has been sold to State Senators J. C. Berger and Bardwell, of Denver, for $35,000. The sale includes all franchises for heating and lighting the town of Sterling. The new owners expect to remodel and enlarge the electric light works, and will also build an ice plant this fall.

LA CROSSE, WIS.—La Crosse capitalists, headed by the La Crosse Water Power Company, which is building a large water-power plant near Hatfield, is making arrangements to furnish light and power to a series of southern Minnesota towns and villages, including Caledonia, Spring Grove, Preston, Houston Hokah, and other places in Fillmore and Houston counties.

MUSKEGON, MICH.—The Grand Rapids-Muskegon Water Power Company, now about to generate electrical power from the Croton dam, has announced that the Croton dam is only the second of a series of six dams to be built and that the remaining four will be constructed within the next ten years at different points near Newaygo. When the sixth is completed it is expected that 66,000 horse-power will be developed.

CHARLESTON, S. C.—The Charleston Water and Light Company has submitted a statement of the cost of construction of its plant, showing it to be nearly $1,300,000, to the joint committee of water supply of city council and the citizens' advisory committee. The attorneys representing the water company, city council and the citizens' committee are now at work endeavoring to agree upon the form of the franchise. When completed it will be presented to the city council for consideration and action.

OZARK, ARK.—The electric light company at this place is now fully organized. The stockholders elected the following directors: A. Bueglar, Alfred Sax, John J. Sax, H. S. Hembree, Father Placidus, of Altus; W. C. Bill, A. D. Reynolds and Harley Russell, of Ozark, and Dr. J. C. Harrod, of Denning. The directors met immediately after their election and chose the following officers: president, A. Bueglar; first vice-president, A. D. Reynolds; second vice-president, W. C. Bill; secretary, Harley Russell; treasurer, John J. Sax.

OBITUARY NOTE.

DR. GEORGE W. PLYMPTON, one of the best-known civil engineers and a veteran teacher of physics and applied mechanics, died at his summer home, Tyson, Vt., on Wednesday, September 11, in his eightieth year. George Washington Plympton was born in Waltham, Mass., and graduated as a civil engineer from the Troy Polytechnic Institute in 1847. He was in the service of the United States government as an engineer during the Civil War. In 1851 he became professor of mathematics in the New York State Normal School, and in 1860 held the same position in the New Jersey Normal School. He began teaching with the Brooklyn Polytechnic Institute in 1863, and was professor of chemistry and toxicology for several years in the Long Island College Hospital, and from 1870 to 1886 was editor of *Van Nostrand's Engineering Magazine*. He was director of the night schools in science of the Cooper Union for the Advancement of Art and Science for thirty-eight years. During Mayor Low's administration in New York city he was president of the Board of Electrical Subways. He was a member of the American Society of Civil Engineers, and had received many honorary degrees and tributes from his confreres and from the engineering fraternity. He is survived by a son, Dr. Henry Plympton, a well-known Brooklyn physician, and two daughters.

ELECTRIC RAILWAYS.

PHILLIPSBURG, N. J.—Phillipsburg capitalists have joined in the organization of a company that is preparing to build a trolley line from this place to Clinton, N. J., where it will connect with other roads. The route will be about thirty miles long, and will pass through Stewartsville, Bloomsbury, Asbury, New Hampton Junction, Glen Gardner and High Bridge.

ALAMEDA, CAL.—The Southern Pacific Company has made its first public move toward the electrifying of its suburban lines by filing applications with the city council for franchises to operate its system in this city by electricity. According to the company, work on the conversion of the system will be begun within four months and completed within three years.

LOCKPORT, N. Y.—An electric trolley railroad from Somerset to Olcott and from Batavia to Medina, thence to Olcott, is assured. The road is to be known as the Medina, Batavia & Ontario Company. Ground has been broken and the work of grading between Olcott and Somerset commenced. S. W. Forst, Supervisor Frank M. Bradley and others are promoting the project.

PRINCETON, IND.—A franchise has been granted by the town board of Patoka to representatives of the Evansville & Southern Indiana Traction Company and it is now understood that the extension of the lines from Princeton to Patoka, four miles north of Princeton, will begin at once. It is the intention of the company to complete the extension of the road by December 1, if possible.

MARTINEZ, CAL.—The board of supervisors has granted A. W. Maltby permission to cross the county roads with an electric car line between Lafayette and Antioch. Maltby asked for permission to pass through the intercounty tunnel, but this privilege will not be granted until his project takes more definite form. Maltby says it is the intention of his associates to construct the road from Antioch to Oakland if sufficient funds can be secured.

HAMILTON, OHIO—The work on the construction of the new line of the Cincinnati Northern Traction Company, between Hamilton and Middletown, has been discontinued for an indefinite period by Superintendent H. L. Carland. The work was to have been completed by March 11, 1907, but litigation arising between the traction company and the Cincinnati, Hamilton & Dayton and Pan Handle railroads made it impossible to finish the work within the specified time.

PHILADELPHIA, PA.—Judge George M. Dallas, of the United States Circuit Court, has appointed Robert M. Watson, of this city, receiver for the Conneaut & Erie Traction Company, a $1,000,000 corporation, at the instance of A. M. Poole, of New York, for himself and other creditors. The company operates through northwestern Pennsylvania and eastern Ohio. Mr. Poole holds one note against the company for $30,270.21, and another for $4,596. He also alleges that there are other outstanding notes amounting to $103,342.

KANSAS CITY, MO.—A company has been organized in Kansas City to take over the projects promoted by Robert G. Rawlings, of Chanute, Kan. Rawlings proposed to build a system of interurban lines connecting Parsons, Cherryvale, Coffeyvale, Independence and Chanute. William B. Henderson, an insurance agent, is interested in the new company. Mr. Henderson says that it is proposed to begin construction work on the line at Parsons at once and that it will be pushed to a conclusion. He says that a power-house will be built at Cherryvale to supply power to all of the different lines.

KEENE, N. H.—Through its stockholders, the Keene Electric Railway has signified its willingness to make an extension of its lines up Washington street, provided the citizens purchase mortgage bonds to the amount of $7,500. Officers have been elected as follows: directors, Thomas T. Robinson, George E. Whiting, Charles A. Stanwood, T. Russell Robinson, Boston; J. H. Jennings, G. A. Litchfield, Keene; Charles O. Whitney, Marlboro; president and general manager, Thomas T. Robinson, Boston; clerk, F. H. Whitcomb, Keene; treasurer, George E. Whiting, Boston; superintendent, J. H. Jennings, Keene.

TELEPHONE AND TELEGRAPH.

PORTLAND, ME.—F. E. Ebersole has been appointed receiver for the North Eastern Telephone Company, the Portland Trust Company declaring the company had defaulted interest on its bonds, amounting to $600,000, and was insolvent. The North Eastern is the largest independent telephone company in Maine.

BUTTE, MONT.—The new telephone line from Monida to Lakeview has been opened for business. It is owned by the Centennial Telephone Company, which is incorporated with a capital of $10,000. The lines of the company connect with all the principal ranches of the country traversed and with the Redrock lakes of the Centennial valley.

TORREON, MEXICO—John Woessner, proprietor of the telephone system in this city that bears his name, has completed arrangements whereby a long-distance telephone line will be strung between Torreon and Durango. Mr. Woessner has also made arrangements with the telephone system of the city of Monterey for connections, and work will commence in the near future.

HOULTON, ME.—At a meeting of stockholders of the Independent Telephone Company it was voted to sell all the company's lines to the Aroostook Telephone Company, a corporation controlled by the New England Telephone and Telegraph Company. The independent company has lines in all parts of Aroostook county. It was announced after the meeting that the transfer will take place as soon as the details of the merger are arranged.

NILES, MICH.—Theodore Thorward, president and general manager of the South Bend Home Telephone Company, is organizing what will be known as the Berrien County Home Telephone Company, which is to have exchanges at Niles, Three Oaks and New Buffalo. Mr. Thorward has agents at work in the rural districts securing five-year contracts. The inducements held out to the farmers are that the above-named exchanges are to be connected with each other through adequate toll lines and that it is the intention of the company to equip the rural lines with selective ringing telephones.

PHILADELPHIA, PA.—Officers of the Pennsylvania Telephone Company, whose headquarters are at Allentown, have confirmed the fact that their company has been merged with the Bell Company of this city. The merger was ratified by the stockholders of the two companies. The stockholders of the Pennsylvania company surrendered their $5,000,000 six per cent stock for an equal amount of seven per cent stock issued by the Bell company, of Philadelphia. The Pennsylvania Telephone Company operates in forty-two counties of Pennsylvania. Its principal exchanges and stations are at Allentown, Easton, Mauch Chunk, Wilkes-Barre, Scranton, Reading, Harrisburg, Carbondale, Danville, Columbia, Clearfield, Gettysburg, Hazleton, Stroudsburg, Huntington, York, Lancaster, Pittston, Shippensburg, Slatington and Williamsport. The total number of telephone instruments on its lines is said to be in the neighborhood of 34,000. The Bell Telephone Company of Philadelphia is said to operate about 48,000 instruments in Philadelphia. This company has had a capital stock, up to this time, of $20,000,000, which includes that of the Delaware & Atlantic Telephone Company, with which it was merged early in 1906. The three companies are all sub-lessees of the American Telephone and Telegraph Company, of Boston.

DATES AHEAD.

Jamestown Tercentennial Exposition. Norfolk, Va., April 26 to November 30.

Old Time Telegraphers' and Historical Association and Society of the United States Military Telegraph Corps. Annual meeting postponed until next year.

Street Railway Association of the State of New York. Annual meeting, Kingston, N. Y., September 21.

New York State Independent Telephone Association. Annual convention, Syracuse, N. Y., September 25.

Railway Signal Association. Annual meeting, Milwaukee, Wis., October 8-10.

American Electrochemical Society. Fall meeting, New York city, October 17-19.

American Street and Interurban Railway Association. Annual meeting, Atlantic City, N. J., October 14-18.

American Association for the Advancement of Science. Chicago, Ill., December.

INDUSTRIAL ITEMS.

THE BUCKEYE ENGINE COMPANY, Salem, Ohio, has published a booklet containing ninety pages of testimonials concerning the efficiency of the Buckeye electric blue-print machine.

THE LOWE ELECTRIC COMPANY, 54 Vesey street, New York city, has published a new catalogue devoted to "Conqueror" electric heating devices. This catalogue will be sent to any one interested upon request.

ALLIS-CHALMERS-BULLOCK, LIMITED, Montreal, Canada, published a programme and register of attendants in connection with the seventeenth annual convention of the Canadian Electrical Association, Montreal, September 11, 12 and 13.

THE MANHATTAN PAINT COMPANY, 92 William street, New York city, is calling attention to a specialty which is designated as its "No-Burn" hot water paint. This is a fire retardant put up in powder form, and is prepared by mixing with boiling hot water.

THE GAIL-WEBB MANUFACTURING COMPANY, Buffalo, N. Y., has ready for distribution a new series of literature illustrating and describing its "Universal" electric light holders, adjustable electric portables, lamp guards, wall fixtures and ceiling fixtures. This descriptive matter will be sent upon request.

THE TACONY IRON COMPANY, Land Title Building, Philadelphia, Pa., has published a new catalogue devoted to the Tacony turbine pumps. This catalogue shows a number of motor-driven applications, and includes a curve sheet giving at a glance the characteristics and operating efficiencies of pumps for every class of service.

THE CHAIN BELT COMPANY, Park street and Eleventh avenue, Milwaukee, Wis., manufacturer of elevating, conveying and power transmitting machinery, has published a very handsome catalogue devoted to its chain belt conveying and elevating apparatus. In addition to the descriptive matter and illustrations of applications, the catalogue is copiously illustrated with half-tone reproductions of details of the chain belt.

THE F. BISSELL COMPANY, Toledo, Ohio, is calling attention to its automatic trolley control and "F. R." trolley wheels. The automatic trolley control keeps the trolley on the wire, lessening the danger of a car getting out of the control of the motorman. The "F. R." trolley wheels are made in both composition and copper. The copper is ninety-nine per cent pure, and the composition a one per cent special alloy. Full information concerning these specialties will be mailed upon request.

THE GENERAL ELECTRIC COMPANY, Schenectady, N. Y., has secured a large order from the Utah Light and Railway Company, of Salt Lake City, Utah. The Utah company is planning large extensions to its present ninety miles of track, and will install fifty new cars. The contract calls for fifty complete quadruple equipments consisting of 200 GE-80 forty-horse-power motors with K-28 controllers. In addition, the company has ordered seventy-four GE-80 motors with extra controllers, circuit-breakers, rheostats, etc., for the reequipment of old cars.

THE ART MACHINE COMPANY, 217-221 Fulton street, Brooklyn, N. Y., is marketing, through its electrical department, the "Economy" electric soldering and branding irons. These irons are made for any voltage up to 125 and 250 volts for their respective applications. The method of heating generates an even distribution of heat in the coppers, maintaining a uniform temperature and permitting a continuous use of the iron while in circuit. The irons are constructed to meet the requirements of the Board of Fire Underwriters and the fire department, and are made of the best approved material.

THE BURNLEY BATTERY AND MANUFACTURING COMPANY, Painesville, Ohio, announces that it has changed its location from the above to North East, Pa. All mail and correspondence should be addressed to the latter place to receive immediate attention. The company's increasing business and its inability to secure suitable quarters in Painesville necessitated this change. In the new location the company will have ample facilities for all its requirements, with new and large buildings and nearby railroad lines. There will be no change in the company whatever, and it will continue to manufacture the Burnley soldering paste, stick, salts, fluxes, dry batteries and other specialties.

Directory of Electrical and Allied Engineering and Scientific Societies.

AMERICAN ASSOCIATION FOR THE ADVANCEMENT OF SCIENCE. Secretary, L. O. Howard, Cosmos Club, Washington, D. C. Annual meeting, Chicago, Ill., December.

AMERICAN ELECTRO-THERAPEUTIC ASSOCIATION. Secretary, Dr. Albert C. Geyser, 352 Willis avenue, New York city.

AMERICAN ELECTROCHEMICAL SOCIETY. Secretary, Dr. J. W. Richards, Bethlehem, Pa. Fall meeting, New York city, October 17-19.

AMERICAN FOUNDRYMEN'S ASSOCIATION. Secretary, Dr. Richard Moldenke, Watchung, N. J.

AMERICAN INSTITUTE OF ELECTRICAL ENGINEERS. Secretary, Ralph W. Pope, Engineering Societies Building, 29 West Thirty-ninth street, New York city. Meetings fourth Friday of each month.

AMERICAN MATHEMATICAL SOCIETY. Secretary, F. N. Cole, 50 West 116th street, New York city.

AMERICAN RAILWAY MASTER MECHANICS' ASSOCIATION. Secretary, J. W. Taylor, Old Colony Building, Chicago, Ill.

AMERICAN ROENTGEN RAY SOCIETY. Secretary, Dr. G. C. Johnson, 514 Bijou Building, Pittsburg, Pa.

AMERICAN SOCIETY FOR TESTING MATERIALS. Secretary, Professor Edgar Marburg, University of Pennsylvania, Philadelphia, Pa.

AMERICAN SOCIETY OF CIVIL ENGINEERS. Secretary, Charles Warren Hunt, 220 West Fifty-seventh street, New York city.

AMERICAN SOCIETY OF MECHANICAL ENGINEERS. Secretary, Calvin W. Rice, 29 West Thirty-ninth street, New York city.

AMERICAN SOCIETY OF MUNICIPAL IMPROVEMENTS. Secretary, G. W. Tillson, Municipal Building, Brooklyn, N. Y.

AMERICAN STREET AND INTERURBAN RAILWAY ASSOCIATION. Secretary, B. V. Swenson, Engineering Societies Building, 29 West Thirty-ninth street, New York city. Annual meeting, Atlantic City, N. J., October 14-18.

AMERICAN STREET AND INTERURBAN RAILWAY ACCOUNTANTS' ASSOCIATION. Secretary, Elmer M. White, assistant treasurer Birmingham Railway, Light and Power Company, Birmingham, Ala. Annual meeting, Atlantic City, N. J., October 14-18.

AMERICAN STREET AND INTERURBAN RAILWAY CLAIM AGENTS' ASSOCIATION. Secretary, B. B. Davis, claim agent Columbus Railway and Light Company, Columbus, Ohio. Annual meeting, Atlantic City, N. J., October 14-18.

AMERICAN STREET AND INTERURBAN RAILWAY ENGINEERING ASSOCIATION. Secretary, S. W. Mower, London, Canada. Annual meeting, Atlantic City, N. J., October 14-18.

AMERICAN STREET AND INTERURBAN RAILWAY MANUFACTURERS' ASSOCIATION. Secretary, George B. Keegan, 2321 Park Row Building, New York city. Annual meeting, Atlantic City, N. J., October 14-18.

ARKANSAS INDEPENDENT TELEPHONE ASSOCIATION. Secretary, Charles F. Speed, Texarkana, Ark.

ASSOCIATION OF EDISON ILLUMINATING COMPANIES. Secretary, W. W. Freeman, vice-president and general manager Edison Electric Illuminating Company, Brooklyn, N. Y.

ASSOCIATION OF ELECTRIC LIGHTING ENGINEERS OF NEW ENGLAND. Secretary, P. C. Brown, Boston, Mass.

CALIFORNIA INDEPENDENT TELEPHONE ASSOCIATION. Secretary, P. T. Whittier, Spencer, Cal.

CANADIAN ELECTRICAL ASSOCIATION. Secretary, T. S. Young, Toronto, Canada.

CANADIAN STREET RAILWAY ASSOCIATION. Secretary, Acton Burrows, 33 Melinda street, Toronto, Ontario.

CENTRAL ELECTRIC RAILWAY ASSOCIATION. Secretary, W. F. Milholland, secretary and treasurer Indianapolis Traction and Terminal Company, Indianapolis, Ind.

COLORADO ELECTRIC LIGHT, POWER AND RAILWAY ASSOCIATION. Secretary, J. F. Dostal, Denver, Col. Annual convention, Denver, Col., September 18-20.

CONNECTICUT STATE STREET RAILWAY ASSOCIATION. Secretary, F. W. Poole, Bridgeport, Ct.

ELECTRIC CLUB OF CLEVELAND. Secretary, George L. Crosby, 1200 Schofield Building, Cleveland, Ohio.

ELECTRICAL CONTRACTORS' ASSOCIATION OF NEW YORK STATE. Secretary, John P. Faure, 77 Water street, Ossining, N. Y.

ELECTRICAL CONTRACTORS' ASSOCIATION OF STATE OF MISSOURI. Secretary, Charles J. Sutter, 1220 Pine street, St. Louis, Mo.

ELECTRICAL TRADES ASSOCIATION OF CHICAGO. Secretary, Frederic P. Vose, Marquette Building, Chicago.

ELECTRICAL TRADES ASSOCIATION OF PHILADELPHIA. Secretary, E. A. Symmes, 810 Drexel Building, Philadelphia, Pa. Meetings, second and fourth Thursdays of each month.

ELECTRICAL TRADES ASSOCIATION OF CANADA. Secretary, William R. Stavely, Royal Insurance Building, Montreal, Canada.

ELECTRICAL TRADES ASSOCIATION OF THE PACIFIC COAST. Secretary, Albert H. Elliott, Claus Spreckel's Building, San Francisco, Cal. Monthly meetings, San Francisco, first Thursday of each month.

ELECTRICAL TRADES SOCIETY OF NEW YORK (Member National Electrical Trades Association). Secretary, Franz Neilson, 80 Wall street, New York city. Board of directors meets second Friday of each month.

EMPIRE STATE GAS AND ELECTRIC ASSOCIATION. Secretary, Charles H. B. Chapin, 154 Nassau street, New York city.

ENGINE BUILDERS' ASSOCIATION OF THE UNITED STATES. Secretary, J. I. Lyle, 39 Cortlandt street, New York city.

ILLINOIS INDEPENDENT TELEPHONE ASSOCIATION. Secretary, C. B. Cheadle, Joliet, Ill.

ILLINOIS STATE ELECTRICAL ASSOCIATION. Secretary, H. E. Chubbuck, La Salle, Ill.

ILLUMINATING ENGINEERING SOCIETY. Secretary, Van Rensselaer Lansingh, Engineering Societies Building, 33 West Thirty-ninth street, New York city.

INDEPENDENT TELEPHONE ASSOCIATION OF TEXAS AND LOUISIANA. Secretary, C. A. Shock, Sherman, Texas.

INDIANA ELECTRIC RAILWAY ASSOCIATION. Secretary, P. H. White, Indianapolis, Ind. Monthly meetings, second Tuesday of each month.

INDIANA INDEPENDENT TELEPHONE ASSOCIATION. Secretary, C. S. Norton, Indianapolis.

INTERNATIONAL ASSOCIATION OF MUNICIPAL ELECTRICIANS. Secretary, Frank P. Foster, Corning, N. Y.

INTERNATIONAL INDEPENDENT TELEPHONE ASSOCIATION. Secretary, Charles West, Allentown, Pa.; assistant secretary, J. A. Harney, Electric Building, Cleveland, Ohio.

IOWA STATE ELECTRICAL ASSOCIATION. Secretary, W. N. Keiser, Dubuque, Iowa.

IOWA STREET AND INTERURBAN RAILWAY ASSOCIATION. Secretary, L. D. Mathes, Dubuque, Iowa.

IOWA INDEPENDENT TELEPHONE ASSOCIATION. Secretary, C. C. Deering, Boone, Iowa.

KANSAS GAS, WATER AND ELECTRIC LIGHT ASSOCIATION. Secretary, James D. Nicholson, Newton, Kan. Next meeting, Topeka, Kan., October 16, 1907.

KENTUCKY INDEPENDENT TELEPHONE ASSOCIATION. Secretary, W. G. Turpine, Henderson, Ky.

MAINE INDEPENDENT TELEPHONE ASSOCIATION. Secretary, M. E. Crow, Houlton, Me.

MAINE STREET RAILWAY ASSOCIATION. Secretary, E. A. Newman, 471 Congress street, Portland, Me.

MASSACHUSETTS STREET RAILWAY ASSOCIATION. Secretary, Charles S. Clark, 70 Kilby street, Boston, Mass. Meets second Wednesday of each month, except July and August.

MASTER CAR BUILDERS' ASSOCIATION. Secretary, J. W. Taylor, 390 Old Colony Building, Chicago, Ill.

MICHIGAN ELECTRIC ASSOCIATION. Secretary, A. C. Marshall, Port Huron, Mich.

MICHIGAN INDEPENDENT TELEPHONE ASSOCIATION. Secretary, W. S. Vivian, Grand Rapids, Mich.

MISSOURI INDEPENDENT TELEPHONE ASSOCIATION. Secretary, George Schweer, Windsor, Mo.

NATIONAL ARM, PIN AND BRACKET ASSOCIATION. Secretary, J. B. Magers, Madison, Ind.

NATIONAL ELECTRICAL CONTRACTORS' ASSOCIATION OF THE UNITED STATES. Secretary, W. H. Morton, 94 Genesee street, Utica, N. Y.

NATIONAL ELECTRICAL TRADES ASSOCIATION. Secretary, Frederic P. Vose, 1343 Marquette Building, Chicago.

NATIONAL ELECTRIC LIGHT ASSOCIATION. Secretary, W. W. Freeman, Engineering Societies Building, 29 West Thirty-ninth street, New York city.

NEBRASKA INDEPENDENT TELEPHONE ASSOCIATION. Secretary, R. E. Mattison, Lincoln, Neb.

NEW ENGLAND ELECTRICAL TRADES ASSOCIATION. Secretary, Alton F. Tupper, 84 State street, Boston, Mass.

NEW ENGLAND STREET RAILWAY CLUB. Secretary, John J. Lane, 12 Pearl street, Boston, Mass. Meetings held on fourth Thursday of every month.

NEW YORK ELECTRICAL SOCIETY. Secretary, G. H. Guy, Engineering Societies Building, 29 West Thirty-ninth street, New York city.

NEW YORK STATE INDEPENDENT TELEPHONE ASSOCIATION. Secretary, R. Max Eaton, Niagara Falls, N. Y. Annual convention, Syracuse, N. Y., September 25.

NORTHWESTERN ELECTRICAL ASSOCIATION. Secretary, R. N. Kimball, Kenosha, Wis. Next annual meeting, Milwaukee, Wis., January, 1908.

OHIO ELECTRIC LIGHT ASSOCIATION. Secretary, D. L. Gaskill, Greenville, Ohio.

OHIO INDEPENDENT TELEPHONE ASSOCIATION. Secretary, O. O. Welsheimer, Columbus, Ohio.

OHIO SOCIETY OF MECHANICAL, ELECTRICAL AND STEAM ENGINEERS. Secretary, F. W. Bullard, Cleveland, Ohio.

OHIO STREET RAILWAY ASSOCIATION. Secretary, Charles Currie, Akron, Ohio.

OLD TIME TELEGRAPHERS' AND HISTORICAL ASSOCIATION. Secretary, John Brant, 195 Broadway, New York city. Annual meeting postponed until next year.

ORDER OF THE REJUVENATED SONS OF JOVE. C. B. Roulet, Mercury, Dallas, Texas.

PACIFIC COAST ELECTRIC TRANSMISSION ASSOCIATION. Secretary, Samuel G. Reed, Portland, Ore.

PENNSYLVANIA STATE INDEPENDENT TELEPHONE ASSOCIATION. Secretary, H. E. Bradley, 135 South Second street, Philadelphia, Pa.

PENNSYLVANIA STATE STREET RAILWAY ASSOCIATION. Secretary, Charles H. Smith, Lebanon, Pa.

PIKE'S PEAK POLYTECHNIC SOCIETY. Secretary, E. A. Sawyer, Colorado Springs, Col. Meetings, second Saturday of each month.

RAILWAY SIGNAL ASSOCIATION. Secretary, C. C. Rosenberg, Bethlehem, Pa. Annual meeting, Milwaukee, Wis., October 8-10, 1907.

RAILWAY TELEGRAPH SUPERINTENDENTS' ASSOCIATION. Secretary, P. W. Drew, Wisconsin Central Railway, Milwaukee, Wis. Next annual meeting, Montreal, Canada, June 24-26, 1908.

SOCIETY FOR THE PROMOTION OF ENGINEERING EDUCATION. Secretary, Arthur L. Williston, Pratt Institute, Brooklyn, N. Y.

SOUTH DAKOTA INDEPENDENT TELEPHONE ASSOCIATION. Secretary-treasurer, E. R. Buck, Hudson, So. Dak.

SOUTHWESTERN ELECTRICAL AND GAS ASSOCIATION. Secretary, R. B. Stichter, Dallas, Tex.

STREET RAILWAY ASSOCIATION OF THE STATE OF NEW YORK. Secretary, J. H. Pardee, J. G. White & Company, New York, N. Y. Annual meeting, Kingston, N. Y., September 21.

TEXAS INDEPENDENT TELEPHONE ASSOCIATION. Secretary, Charles F. Speed, Texarkana, Tex.

UNDERWRITERS' NATIONAL ELECTRIC ASSOCIATION. Secretary Electrical Committee, C. M. Goddard, 55 Kilby street, Boston, Mass.

VERMONT AND NEW HAMPSHIRE INDEPENDENT TELEPHONE ASSOCIATION. Secretary-treasurer, G. W. Buzzell, St. Johnsbury, Vt.

VERMONT ELECTRICAL ASSOCIATION. Secretary, C. C. Wells, Middlebury Electric Light Company, Middlebury, Vt.

VIRGINIA STATE INDEPENDENT TELEPHONE ASSOCIATION. Secretary, B. L. Fisher, Rocky Mount, Va.

WESTERN ASSOCIATION OF ELECTRICAL INSPECTORS. Secretary, W. S. Boyd, Chicago.

WESTERN SOCIETY OF ENGINEERS (Electrical Section). Secretary, J. H. Warder, 1737 Monadnock Block, Chicago, Ill.

WISCONSIN ELECTRIC AND INTERURBAN RAILWAY ASSOCIATION. Secretary, Clement C. Smith, president Columbia Construction Company, Milwaukee, Wis.

WISCONSIN INDEPENDENT TELEPHONE ASSOCIATION. Secretary, J. C. Crowley, Jr., Superior, Wis.

Record of Electrical Patents.

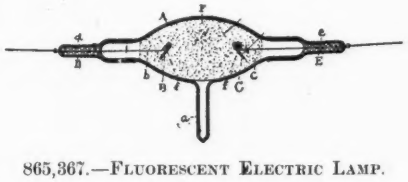
Week of September 10.

865,367. FLUORESCENT ELECTRIC LAMP. Thomas A. Edison, Llewellyn Park, N. J. A fluorescent screen, composed of tungstate of calcium, is used.

865,368. SYSTEM OF ELECTRICAL DISTRIBUTION. Justus B. Entz, Philadelphia, Pa. A storage battery and booster system.

865,383. CONTROLLING DEVICE. Arthur E. Handy, Providence, R. I., assignor to the Rhode Island Elevator and Machine Company, Providence, R. I. A controller for elevators or the like, operated by a magnet.

865,388. CONTROL OF AN ELECTRICALLY DRIVEN AIR-COMPRESSOR. Ebenezer Hill, Norwalk, Ct. A motor-regulator controlled by air pressure.



865,367.—FLUORESCENT ELECTRIC LAMP.

865,389. CONTROL OF ELECTRICALLY DRIVEN AIR-COMPRESSOR. Ebenezer Hill, Norwalk, Ct. Independent means of rendering the controlling valves inoperative are provided.

865,412. ATTACHMENT FOR ELECTRIC MOTOR CONTROLLERS. Albert H. Mathewson, Thompsonville, Ct. A device for recording the correct use of controllers.

865,432. ELECTRIC TIME-SWITCH. William D. Ross, Providence, R. I. A rotary switch controlled by clockwork.

865,470. PRINTING TELEGRAPH. John E. Wright, New York, N. Y. Two independent line circuits are utilized.

865,473. BREAK-ARM FOR ELECTRIC WIRING. Walter A. Arthur, Manchester, N. H. An adjustable, pointed bracket.

865,503. ELECTRICAL ACCUMULATOR. John Knobloch, New York, N. Y. A battery of the Faure type.

865,516. ELECTRIC REGULATOR. Frank C. Newell, Wilkinsburg, Pa., assignor to Westinghouse Electric and Manufacturing Company. A regulator having two rheostats and a magnetically operated contact member.

865,527. HEATING DEVICE. Albert A. Radtke, Chicago, Ill. An electrical egg cooker.

865,536. SELECTOR FOR AUTOMATIC TELEPHONE EXCHANGES. Charles E. Scribner, Jericho, Vt., and Claude D. Enochs, Chicago, Ill., assignors to Western Electric Company, Chicago, Ill. A rotating contact arm moved by a ratchet is used.

865,555. AUTOMATIC ELECTRIC SIGNAL SYSTEM. Edwin T. Ackerman, Chicago, Ill. A time-signaling system.

865,567. FUSE-PLUG. Robert C. Cole, Hartford, Ct., assignor to the Johns-Pratt Company, Hartford, Ct. A case for enclosing a cartridge fuse.

865,588. ELECTRIC SWITCH. Edward M. Hewlett and Theodore E. Button, Schenectady, N. Y., assignors to General Electric Company. A toggle switch.

865,598. PROGRAMME CLOCK. De Witt H. Leas, Delaware, Ohio. A dial clock for electrical signals.

865,606. INSULATING MATERIAL AND METHOD OF PRODUCING THE SAME. Charles L. Norton, Manchester, Mass., assignor to Asbestos Wood Company. A porous body of asbestos is impregnated with magnesium hydrate and an oxidizable hydrocarbon.

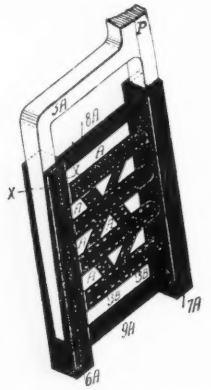
865,608. PROCESS OF BAKING CARBON ELECTRODES AND HEATING BY ELECTRICITY AND COMBUSTION. Edgar F. Price, Niagara Falls, N. Y. The carbons are first heated by combustion, then electrically.

865,609. PROCESS OF SMELTING REFRACTORY ORES AND PRODUCING LOW-CARBON FERRO ALLOYS. Edgar F. Price, Niagara Falls, N. Y. A furnace for producing ferrosilicon and the like.

865,617. INDUCTION-MOTOR. Charles P. Steinmetz, Schenectady, N. Y., assignor to General Electric Company. A cooling liquid is circulated through a tubular secondary winding.

865,618. PRODUCTION OF NITROUS COMPOUNDS. Charles P. Steinmetz, Schenectady, N. Y., assignor to General Electric Company. A deflected arc in the nitrating chamber is rotated magnetically.

865,662. IGNITER SYSTEM. Richard Varley, Englewood, N. J., assignor to the Autocoil Company. The contacts are controlled by a rotating cam.



865,503.—ELECTRICAL ACCUMULATOR.

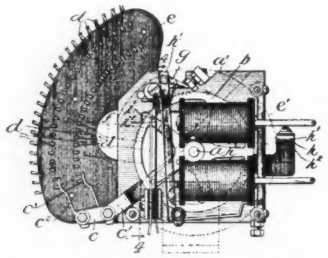
865,697. INSULATOR. Robert E. Henderson and John N. King, Los Angeles, Cal., assignors of one-fourth to E. O. Williams and one-fourth to James W. King, Los Angeles, Cal. The insulator is provided with a curved wire groove.

865,701. ALTERNATE-CURRENT GENERATOR AND MOTOR. Alexander Heyland, Brussels, Belgium. A commutator machine.

865,711. SEPARATING METAL FROM DEPOSITS. Isidor Kitsee, Philadelphia, Pa. A high-potential is maintained between electrodes embedded in a rotating drum.

865,732. DYNAMO OR THE LIKE. Charles A. Vandervell, London, and William H. W. Proctor, Coventry, England. A machine in which both armature and field may be rotated.

865,771. ELECTRIC SIGNAL-BELL. Harold W. Eden, Detroit, Mich., assignor to P. R. Manufacturing Company, Detroit, Mich. The base is stamped from sheet material.



865,536.—SELECTOR FOR AUTOMATIC TELEPHONE EXCHANGE.

865,781. ELECTRIC RAILWAY SIGNALING DEVICE. Edward B. Howell, Butte, Mont. A trolley runs on overhead signaling conductors.

865,811. SYSTEM OF MOTOR CONTROL. William H. Powell, Norwood, Ohio, assignor to Allis-Chalmers Company, and the Bullock Electric Manufacturing Company. The field strength and applied electromotive force are inversely varied in alternate steps.

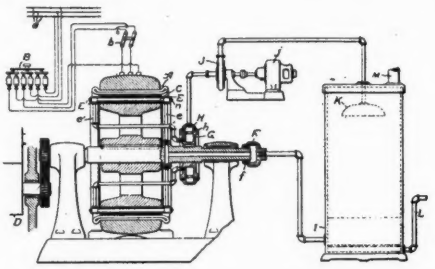
865,812. MOTOR-CONTROL SYSTEM. William H. Powell, Norwood, Ohio, assignor to Allis-Chalmers Company and the Bullock Electric Manufacturing Company. Mechanical energy is supplied at a uniform rate, and transformed into electrical energy.

865,813. METHOD AND MEANS FOR CONTROLLING ELECTRIC MOTORS. William H. Powell, Norwood, Ohio, assignor to Allis-Chalmers Company and the Bullock Electric Manufacturing Company. Mechanical energy is supplied at a uniform rate as the field and applied electromotive force are inversely and successively varied.

865,814. MOTOR-CONTROL SYSTEM. William H. Powell, Norwood, Ohio, assignor to Allis-Chalmers Company and the Bullock Electric Manufacturing Company. The field and applied electromotive force are inversely and simultaneously varied.

865,815. SYSTEM OF MOTOR CONTROL. William H. Powell, Norwood, Ohio, assignor to Allis-Chalmers Company and the Bullock Electric Manufacturing Company. Two sources of electromotive force are used for controlling the field.

865,816. MOTOR-CONTROL SYSTEM. William H. Powell, Norwood, Ohio, assignor to Allis-Chalmers Company and the Bullock Electric Manufacturing Company. A motor with a main and opposing field.



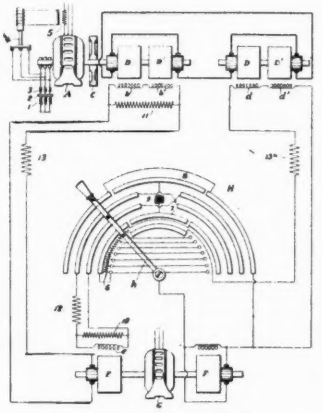
865,617.—INDUCTION-MOTOR.

865,817. SYSTEM OF MOTOR CONTROL. William H. Powell, Norwood, Ohio, assignor to Allis-Chalmers Company and the Bullock Electric Manufacturing Company. The motor armature is supplied from two sources of current in series.

865,818. SYSTEM OF MOTOR CONTROL. William H. Powell, Norwood, Ohio, assignor to Allis-Chalmers Company and the Bullock Electric Manufacturing Company. The electromotive force of the generator is reversed by reversing the residual magnetism.

865,819. MOTOR-CONTROL SYSTEM. William H. Powell, Norwood, Ohio, assignor to Allis-Chalmers Company and the Bullock Electric Manufacturing Company. The polarity of a supplying generator is determined by excitation from a separate source.

865,820. MOTOR-CONTROL SYSTEM. Walter J. Richards, Norwood, Ohio, assignor to Allis-Chalmers Company. A plurality of dynamoelectric machines separately excited and connected in series.



865,812.—MOTOR-CONTROL SYSTEM.

865,821. SYSTEM OF MOTOR CONTROL. Walter J. Richards, Norwood, Ohio, assignor to Allis-Chalmers Company. The motor field is excited by the cumulative action of two sources of current.

865,822. METHOD OF AND MEANS FOR CONTROLLING ELECTRIC MOTORS. Louis E. Bogen, Cincinnati, Ohio, assignor to Allis-Chalmers Company and the Bullock Electric Manufacturing Company. The field-windings of the supplying generator are excited from independent sources.

865,879. ELECTRIC CONTACT RAIL. Ed W. Farnham, Chicago, Ill., assignor to the Farnham Company, Chicago, Ill. An inverted third rail.

865,937. TELEPHONE RECEIVER. Edwin J. Quinby, Portland, Me. A receiver with a metallic casing.

865,970. CONTROLLER FOR ELECTRIC MOTORS. Charles S. Lee, Troy, N. Y. A circuit-breaker operated by the controller shaft.